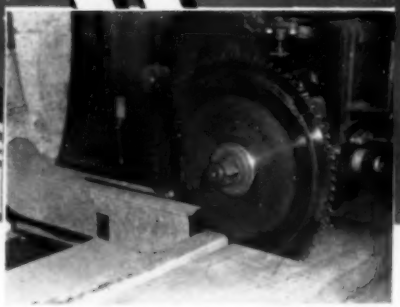
WOOD WORKING Digest



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WOOD WORKING DIGEST

222 E. Willow Ave. Wheaton, Ill.

Form 3547 Requested Return Postage Guaranteed

A HITCHCOCK PUBLICATION

UNIVERSITY MICROFILMS
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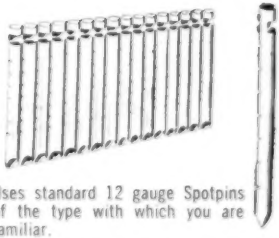
with SPOTNAILS compact automatic set-up

Individual pinning units mount on your own sash clamp. Easily adjustable . . . easily detachable.

Slap your sash—as usual—into your clamp. One pneumatic valve action brings all the heads in over the sash to pin—and to snap back out of the way for easy lift-out of the pinned sash. Simple—uncomplicated.

235 Completed frames before easy reloading of pins. Red light announcement of time to reload.



Uses standard 12 gauge Spotpins of the type with which you are familiar.

Now being used in actual production.

Practical millwork men approve it.

Write for details—and tell us what model sash clamp you use.

Patents Applied For

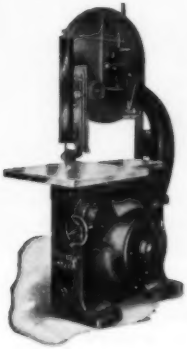
SPOTNAILS, INC.

Evanston 1, Illinois

"OLIVER" BAND CUT-OFF SAW

Still the efficient way to cut logs and timbers!

One owner reports it *reduces cutting time 80%*



"Oliver" builds the finest Band Saws in four sizes: 18", 30", 36" and 38". Write for details.

After using this Band Saw for seven years, one owner reported: Formerly we kept two saws busy ten hours a day. Now we do our cutting in four hours a day. Upkeep is practically nothing.

The "Oliver" Band Cut-Off Saw cuts logs, timbers, etc. in short lengths for shingles, staves, veneer stock—in fact, any cross-cutting formerly done by other types of saws.

"Oliver" Band Cut-Off Saws are built in three sizes. The largest cuts 60-inch logs. They are speedier, use less power and give years of profitable service. Write for Bulletin No. 316.

OLIVER MACHINERY COMPANY

Established 1890

GRAND RAPIDS 2, MICHIGAN

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ENDLESS BED SANDER

WITH SELF-OSCILLATING DRUMS AND VARIABLE SPEED DRIVE, 12' TO 35' PER MINUTE

The self-oscillating drum (patented) is the greatest improvement in drum sander construction in many years. Eliminates the multi-jointed, old style oscillator, with its bulky cover and separate motor drive. Operator now can get close to the machine for changing paper, etc.

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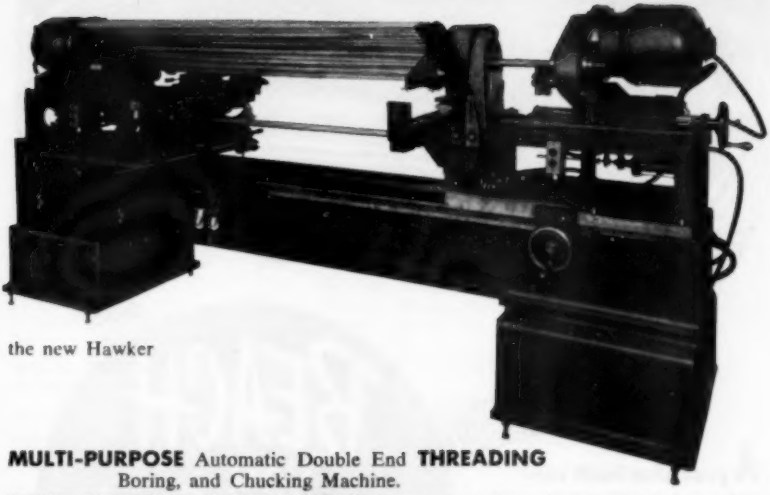

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MULTI-PURPOSE Automatic Double End **THREADING** Boring, and Chucking Machine.

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AUTOMATIC HOPPER FEED handles round, square, or rectangular stock. Positive feed to work table, positive indexing across work table.

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WOOD WORKING Digest

JUNE, 1954
Vol. 56, No. 6

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Cut Steam Consumption With

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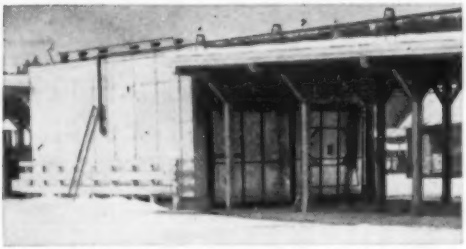

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General Offices: Eugene, Oregon / Plywood plants at Eugene and Willamina
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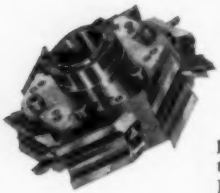
When They're Diehl they cut... True Longer!



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Why? Because every Diehl Cutter and Cutterhead is made by picked craftsmen, who consider their work a *profession*—and Diehl tools as *precision instruments.* Such men make *sure* every edge is ground and heat-treated *right*—that static and dynamic balance are *perfect,* before any Diehl Cutter or Cutterhead leaves the factory.

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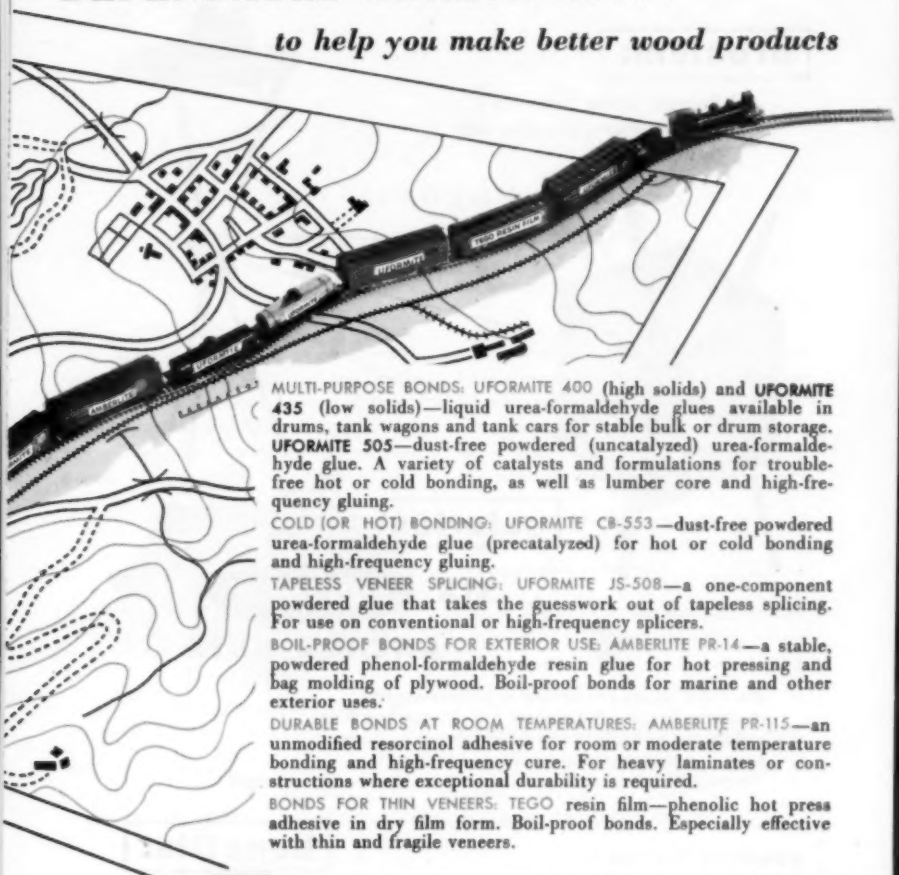
DEPENDABLE ADHESIVES . . .

to help you make better wood products



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Name .....

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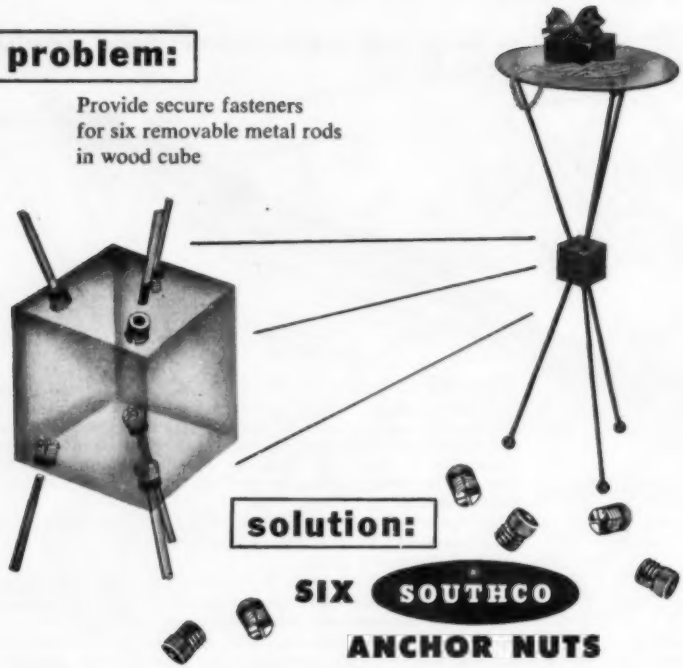
problem:

Provide secure fasteners
for six removable metal rods
in wood cube



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benefits:

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2) Size and cost of packing case reduced
3) Lower shipping costs
4) Less storage space
5) Quick and easy assembly by customer
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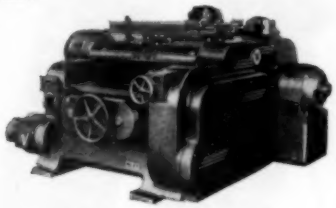

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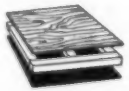
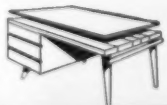
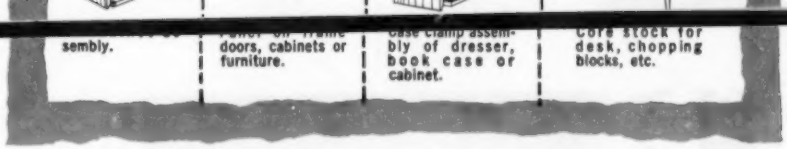


doors, cabinets or furniture.

case clamp assembly of dresser, book case or cabinet.



Core stock for desk, chopping blocks, etc.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doors, cabinets or furniture.
case clamp assembly of dresser, book case or cabinet.
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HAVE YOU HESITATED to convert to speedy, efficient high frequency production bonding because of high cost of the special presses usually involved? Your existing clamps or equipment can be economically adapted for use with THERMATRON high frequency generators!

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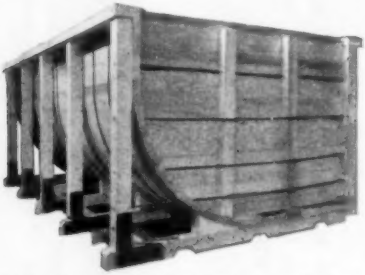

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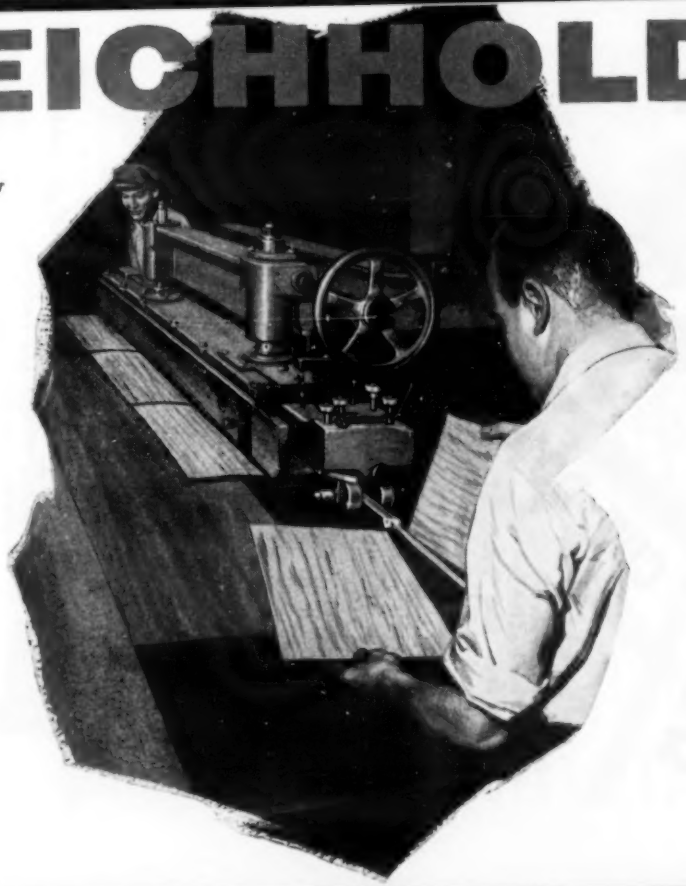

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Sodium Sulfate
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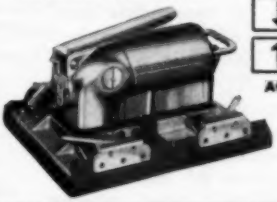

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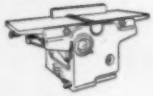

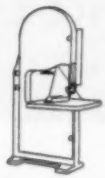

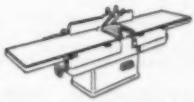

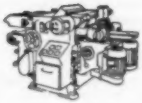

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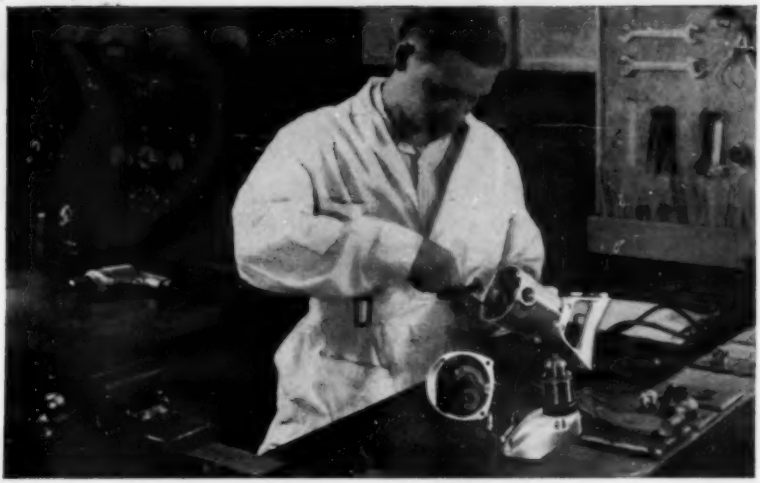

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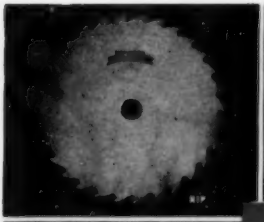

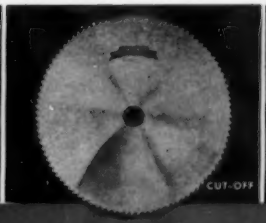

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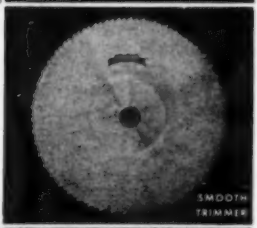

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Keep **WOOD** *on the March*

We are very pleased with the results of the first annual WOOD WORKING DIGEST Award of Merit Contest. The many comments passed along to us indicate that the industry appreciates this effort to recognize those firms and associations who are successfully educating the public to the many uses and values of wood and its advantages over other materials. No doubt many more will plan to enter next year's contest. Remember, it is what you do *this year* that will be considered in the judging for the second contest. Now is the time to do the things that will win the Award of Merit for your organization. The pictures and names of the award winners appear on page 169.

The Award of Merit contest was organized to help keep wood on the march and at the head of the line! We believe that while many materials have competed with wood and, in some instances, made substantial inroads into the use of lumber for some applications, wood is still the material that competitive products must beat. Notice how much of the advertising for competitive products states that this material can be sawn like lumber, nailed or finished like lumber.

There is a tremendous future for wood, but it may mean that it will take new forms such as the use of wood in the manufacture of particle boards, insulation boards, the current rapid development of hardboards, and woods used as a basic material, though covered with other materials — metal-faced plywood is an example of this.

I have recently spent a month or so in the Gulf Coast area getting material for future articles in WOOD WORKING DIGEST. I was impressed with the many important uses of wood in that area. Not only are there many marine uses, but the very important though limited use of lining immense tanks with wood.

Another company is manufacturing a three-ply block flooring, two outer plys of oak and the center of gum. This is practically indestructible, thanks to the chemical treatment of the wood and the special adhesive used.

The manufacture of molded articles from wood particles is again of interest to many and should probably be worth investigating by anyone who has access to a sufficient quantity of this material.

We can "keep wood on the march," but it takes unified effort, plus research, to achieve public understanding and appreciation of wood and its real value.

Ned Bailey
Editor-in-Chief

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Comments from THE NATION'S CAPITAL

By Arnold Kruckman
Washington Correspondent

In a meeting with the Business and Defense Services Administration, U. S. Department of Commerce, and other government agencies, it came out sharply that the plight of the domestic hardwood plywood industry is more than notable. The situation has engaged the interest and attention of the Commercial Policy Staff of the State Department, the Bureau of Customs, and the Commerce Department's Bureau of Foreign Commerce. Naturally the U. S. Tariff Commission also has a live interest.

Just what may happen when the problem is put up formally to the government bothers many people. Recently the President again upset the "escape clause" in the Reciprocal Trade Law. As is well known, this clause was placed in the law to help American producers whose business was being injured by foreign imports that were either greatly hampering them, or entirely driving them out of business. Recently, the nation-wide Committee of Industry, Agriculture and Labor on Import-Export Policy made the formal statement that this is the thirty-seventh time that the "escape clause" of the Reciprocal Trade Law has been blocked by executive action. It is the fourth time within two years that the chief executive has overridden the findings of Federal experts who were strongly convinced there was serious injury from cut-rate import competition. O. R. Strackbein, chairman of the committee, made the statement that over 90% of all American enterprises, most of them small businesses, were affected by the action.

As business people should know, but many of them don't know, the "escape clause" was written into the Trade Agreement Act to give special protection to domestic industries; and the record shows that American industry has had an extremely hard time under the circumstances. Even the U. S. Tariff Commission, being aware of probable executive action, has not been very prompt to act when industry has made its appeal for relief.

Out of 60 petitions filed relatively recently, only three were recommended for approval to the President; and those three were promptly turned down by the President. In the current case the imports covered were scissors and shears; and the commission informed the President that during 1952 and 1953 the import of products has been four to five times greater than imports in any year before World War II.

In this case the American producers are much in the same position as some other manufacturers in New York state. After a ruling came from the Tariff Commission and was turned down by the White House they found that virtually their entire industry was wiped out. This was when the New Deal was going high, wide and handsome in the earlier part of the Truman era. The executive found that in his opinion it was for the greater good of all the world, and for the greater good of all the people of the world, if the Europeans were permitted to continue their business of importing into the United States.

It was determined, in this case, that the Europeans would have practically no business which might take the place of the production in which they were engaged; on the other hand it was held that American producers, and American workers could easily find other outlets for their facilities and their labor.

Senator George W. Malone--"Molly"--is the one man on the Hill who has sincerely been striving strenuously to make the "escape clause" effective. He thinks that we should take from Europe only those imports of which we have none, or of which we have a very scarce, or moderate supply; and keep out of this country the products which we make in reasonable abundance. Malone has carried on his fight more or less lone-handed, and apparently has not had much support or approval. It is really up to the business community that is concerned to encourage his purposes, and to give him active and open support. It is quite clear that the White House—and this does not mean the President alone—will not give the business community much support in these tariff problems so long as the State Department, and other agencies of government, involved with Europe, urge that we permit the importation of goods with which we can have no real competition. It must be borne in mind that Europeans always get their materials far cheaper than we do; their labor is far less costly; every cost of production makes it easy for them to flood our markets with cheap goods if the importation is not restricted.

Living standards in Europe, as most of us well know, are far lower than they are here; and our various agencies who are active in Europe apparently do very little to elevate the standards of the Europeans; profits to European producers are far higher than profits to American industrialists, when they have no foreign factories. Mass production, as we know it, and as it is practiced in this country, is virtually unknown in Europe. By and large it should be remembered that European industry overwhelmingly consists of small units, and is largely the work of individuals rather than of the sort of machinery with which we are familiar.

Robert N. Hawes, Counsel for the Hardwood Plywood Institute and Fine Hardwoods Association, has made three specific recom-

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mendations to government agencies calling for government action to aid the hardwood plywood industry:

1. Enforcement of anti-dumping laws as an immediate measure to aid the industry.
2. Explore, as a temporary measure pending official action, the possibility of establishing import quotas.
3. Establish flexible rates of duty to bring the landed price of imported plywood in line with domestic production costs.

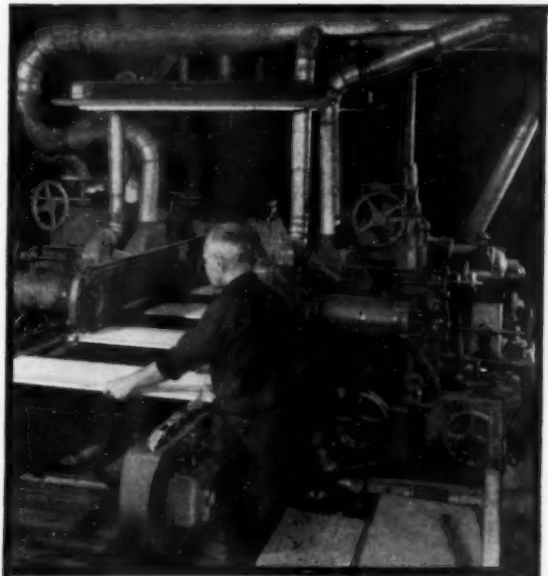
Mr. Hawes has asked the U. S. Tariff Commission to restore the duty rates to the January 1, 1945 level pending completion of the inquiry. Statistical data shows that the sales of plywood manufacturers are falling off rapidly, while domestic consumption of hardwood plywood is increasing substantially. An industry spokesman states that sales of imported hardwood plywood, which is selling at less than U. S. cost of production, have increased rapidly since 1950, when the import duty was reduced from 40% to 20%. Plywood imports amounted to more than 220 million square feet in 1953, an increase of 251% over 1950 imports. During the first two months of 1954, hardwood imports totaled 34.5 million square feet, an increase of 54% over the corresponding period of 1953.

Mr. Hawes predicted that, if the current rate of imports continues, the total will exceed 300 million square feet in 1954. He pointed out what this means to the domestic industry by showing that production, during the first quarter was 28.1% lower at American plants than in the first quarter of 1953, with corresponding losses in employment and payrolls.

An industry survey taken at 40 plants, producing hardwood plywood for market sale, shows the employment of 6,636 workers in the first quarter of 1954. This total is 1,602, or 19.4% less than the number of workers employed in the plants during the comparable period last year. The loss of employment meant a reduction of 1,262,178.7 hours worked, or 28% less than in the corresponding period of 1953, with a resultant loss of almost $2 million to the workers, or to be exact, $1,871,024 in payrolls. Since many of the hardwood plywood plants are located in small towns, where community welfare is largely dependent on full and continuous operation of the plants, such payroll losses present a very serious problem which is exactly similar to other industrial experiences in other parts of the United States. It is always the small community that is hit hard by these import favors.

Citing an example of how American hardwood plywood manufacturers are feeling the pinch of competition from low-cost labor countries, an industry spokesman said that one company's profit from the sale of products valued at $685,039 was $60,000 in the first six months of 1953, but it realized a profit of only $1,568 on its year's operation after producing $581,136 worth of plywood in the second half of the year. In the first quarter of 1954 this company's operations resulted in a net loss of $4,100. The impact of competition from imported plywood of cheap labor countries also is being felt by the hardwood veneer industry.

The position of the hardwood plywood manufacturers in seeking relief is supported by the Fine Hardwood Association, the National Lumber Manufacturers and the National Woodwork Manu-



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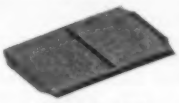

Blind dadoing and relishing panels

Beveling and cutting clamp rail grooves

Sizing, tenoning, and coping door rails

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facturers Association. Lumber and door industry representatives also urged that imports of their products be watched so that trends can be followed and extremes anticipated. The industries are receiving active and intelligent support from BDSA Administrator Charles F. Honeywell. Much of the work is under the direction of Bernard L. Orell, Director of BDSA's Forest Products Division. The industry representatives active in the undertaking are: M. W. Pollack, vice-president, U. S. Plywood Corporation, New York; Leo Bodine, exec. vice-president, National Lumber Manufacturers Assn., Washington, D. C.; John Huling, assistant secretary, Fine Hardwood Assn., Chicago, Ill.; H. J. Moriarity, manager, Peerless Plywood Co., High Point, N. C.; Robert N. Hawes, counsel, Hardwood Plywood Institute, Washington, D. C.; Oscar Witt, vice-president, Roddis Plywood Corp., Marshfield, Wis.; Leo Weller, National Woodwork Manufacturers Assn., Washington, D. C.

If you want detailed information about plywood import statistics from 1934 to 1953 apply to Business Information Service, BDSA, Washington 25, D. C.

The U. S. Tariff Commission recently announced that it was instituting a new investigation to determine whether wood screws are being imported in such increased quantities as to seriously threaten the domestic industry. The public hearing will take place in May and June. The Tariff Commission emphasizes that upon the application of the U. S. Wood Screw Service Bureau, New York City, the Commission was not able to confirm the complaint of serious injury, and could not recommend any change in the existing duty.

C. A. Rishell, Director of Research, TECO, reports a sharp increase in the number of manufacturing companies requesting individual research projects. During the first four months of the current year the number went up 36%. The laboratory was requested to investigate edge grain laminated lumber, industrial flooring, utilization of mill and plant residues, laminated vehicle planking, tallying and grading devices, composite wood beam ladders, design and production methods for wooden containers, plant surveys for setting up laminating facilities, new products for short lengths, chemical extractives from wood and bark, developing by-products from leftovers, and market survey for new products from low-grade lumber. Also projects for private firms and for the government including quality control for marine laminated; government specifications for wood products, charcoal and by-products; door testing; car decking; battery separators and wood preservation.

S. M. Nickey, Jr., chairman, National Oak Wilt Research Committee, recently announced here, after three years intensive research, scientists in seven leading universities, spending $140,000 provided by the industries, have reduced the oak wilt disease as a potential destroyer of $2 billion worth of oak forests to a nuisance which can easily be controlled.

Heston H. Walker, office manager and comptroller, National Lumber Manufacturers Association, was elected president of the Washington Chapter of the National Office Management Association for 1954-55.

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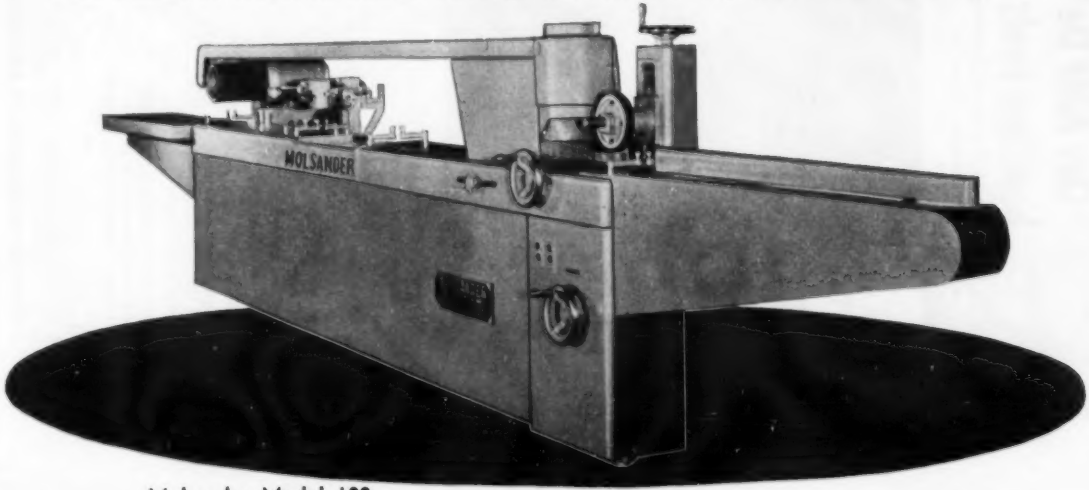

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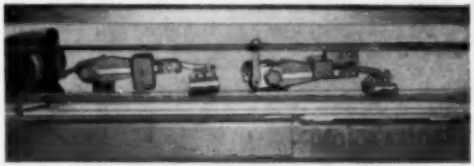

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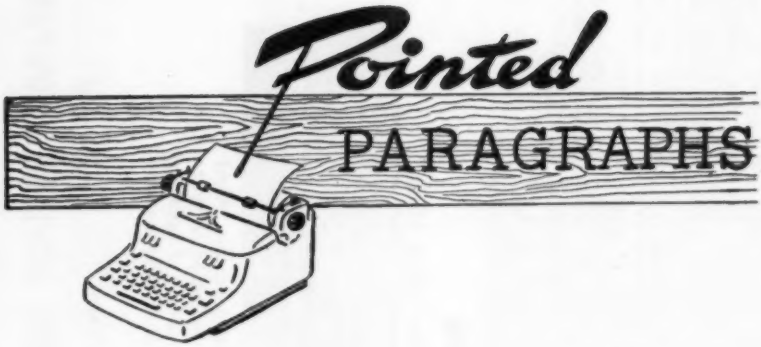

Pressure-treated, glued-laminated wood bridge stringer members up to 74 feet in length are now being extensively used in western highway structures. A service life in excess of 75 years, with minimum maintenance, is anticipated.

Wood is a versatile material. Statistics list more than 10,000 different ways that we use wood and products from wood. Numerous articles manufactured from wood have little resemblance to the original raw material.

A Monsanto Chemical Company executive predicts that improved bond strength may prove to be the "something extra" that will bolster the market for American made plywood. Fabrication of a more durable product by upgrading the adhesive bond is a certain route to the attainment of higher quality.

The Ford Motor Co. is trying out "Impreg" to improve production methods on its 1956 line of cars. "Impreg" was developed at the U.S. Forest Products Laboratory. It is wood impregnated with resin to reduce swelling and shrinking from moisture changes in the atmosphere. Introduction of this new material will mean the first basic change in pattern making in many years.

The automobile industry uses more than 6 million board feet of mahogany every year in model making. This issue carries a complete story on mahogany and its many uses.

Also listed in the June issue of WOOD WORKING DIGEST are the names of the winners in the Award of Merit Contest. See page 169 for the story of the presentations made at the National Meeting of the Forest Products Research Society at Grand Rapids, Michigan, in May.

The Maritime Administration has incorporated the Teco system of timber construction in its new standardized, demountable wood gangways, or

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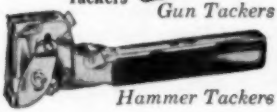

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thwartship crossings, for the Liberty type ships used for government grain storage. These new prefabricated gangways should give service for at least 15 years.

Wood was noticeably missing at the Basic Materials Show recently held in Chicago. We have mentioned this matter in a previous editorial, but it is hoped that some of our industry will take the initiative in correcting the situation before the next conference is held.

One new use for wood shown at the conference—and to be fully described in a later issue—is the use of wood coated with one of a variety of products made by the U. S. Rubber Co. Utilizations for this combination of materials varies from dipping tanks to various types of industrial flooring and wooden pipes.

It is now expected that oak wilt—once dreaded as a potential destroyer of America's two billion dollar oak forest resources—can be reduced from a menace to a nuisance by control methods developed in a three year research program. Among the new control methods has been the use of chemicals applied by aerial spraying; removal of diseased timber; and some work with large plows in destroying root grafts.

More than 1,000 tree species grow in the U.S. Some 100 are of direct commercial importance and approximately 35 are commonly manufactured into lumber.

Requirements for wooden boxes to be used for military and similar purposes are expected to be appreciably lower in 1954 than they were in 1953. There is some hope that there will be an increase over the current demand later in 1954, particularly if the partial shut-down of government-owned factories takes place as expected.

Already construction for the first three months is at a record high. Although home starts are off in most areas, outlook seems to insure another million-start year. Pressure of population increase, which most experts say requires the nation to build a minimum of 1.4 million new homes a year for the next decade, is certain to be felt.

Home builders and manufacturers have teamed up to produce a $100,000, full length dramatic movie designed to make home buyers out of viewers. Titled "Million Dollar Castle," the film depicts in dramatic plot form the difference between homes and living conditions at the turn of the century and now. The film was premiered in Washington at the spring meeting of the board of directors of the National Association of Home Builders. Requests for showing should be directed to the attention of Conrad P. Harness, National Association of Home Builders, 1028 Connecticut Ave., N.W., Washington 6, D.C.

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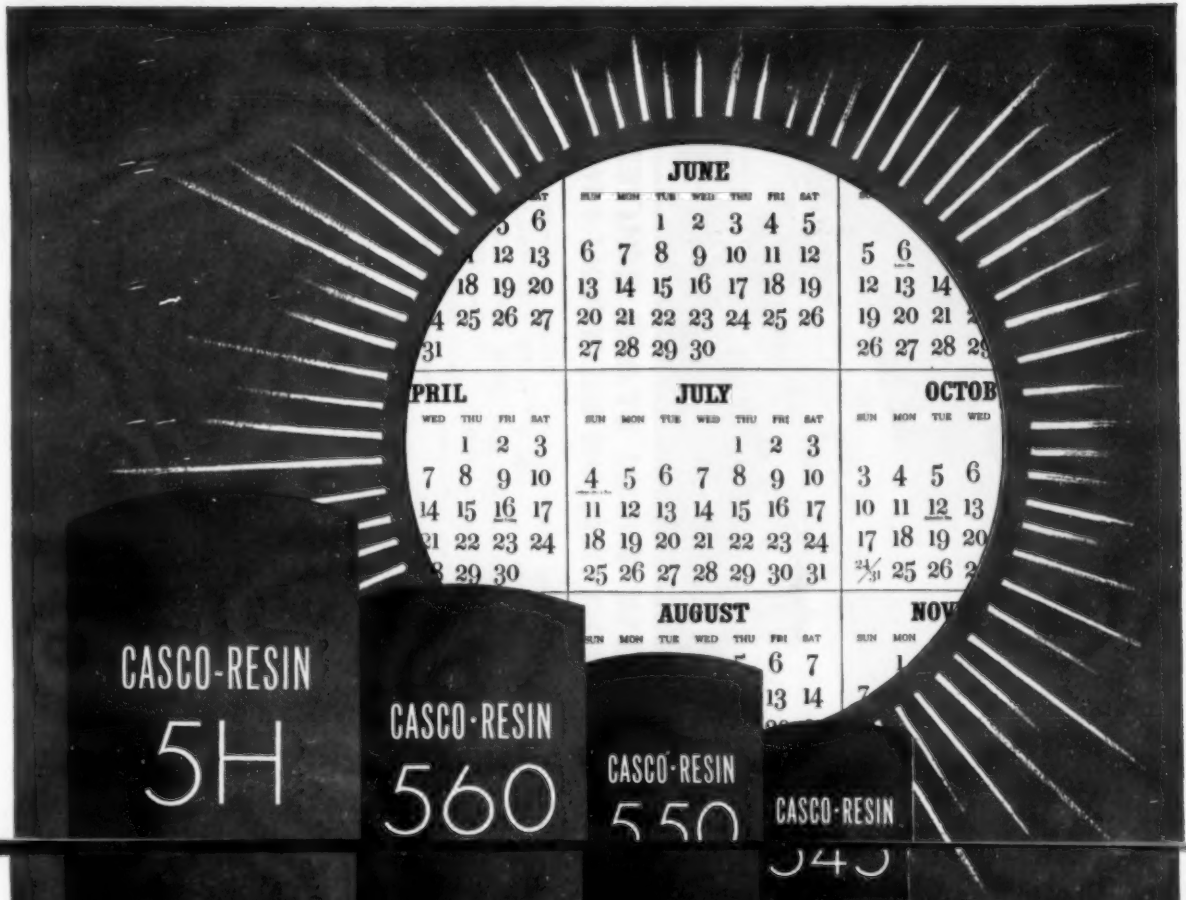
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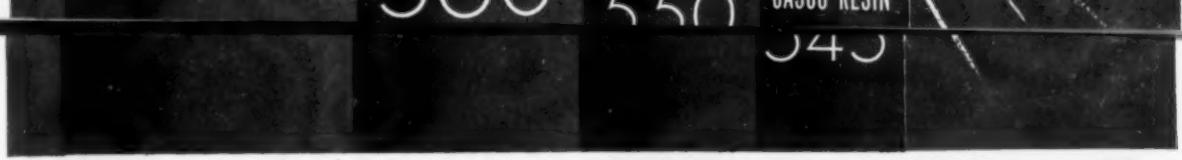

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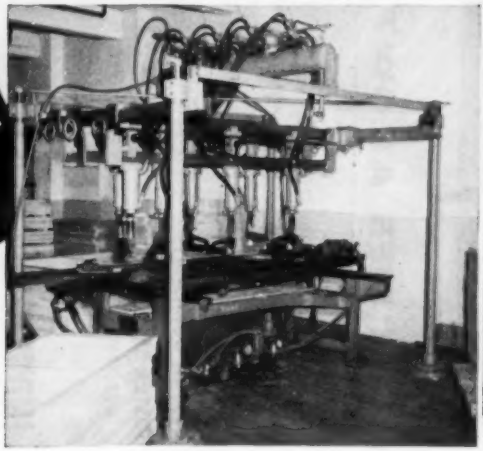

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GUN STOCKS Made With Carbide Tools

By Thomas D. Perry

MUCH has been written and even more said about the advantages of carbide tipped tools in the woodworking industry. But in relation to the age of tool steel, carbide cutters are in their infancy. No one that is well informed has any doubts about the superiority of carbide cutters, but in the welter of the enthusiastic claims of salesmen, and the bragging of users, who have had extraordinary success on an isolated installation, the degree of superiority has been considerably obscured.

If one were to visit the Marlin Firearms Co., New Haven, Conn., where carbide tools have been under study and investigation for some five years he would be amazed at the actual achievements stemming from carbides. With a traditional background of Yankee ingenuity, this company has abundantly proved that carbide makes the best edge tools for cutting woods that have, so far, been developed.

The carbide applications here are not enthusiastic outbursts, but hard-headed and long-range developments that have become firmly established in a conservative New England factory.

Popularly speaking, tungsten carbide is a type of tool material that holds its cutting edge surprisingly well. Investigation shows that carbides are fundamentally different, both in derivation and application, from conventional materials.

Tool steels, for example, consist of various alloys to provide hardness, ductility, toughness, abrasive resistance as well as other properties in many combinations according to the work in hand. Examples are the file that requires extreme hardness, but does not need the other qualities; the saw tooth that must have ductility to be swaged or spring-set, but with a durable cutting point; and a boring tool which must present maximum torsional strength to resist twisting.

These alloys are melted, mixed and combined into cast ingots, which are heated and rolled to the desired shapes, producing a fibrous structure that is tough and sturdy. Hardness is a quality developed by heat treating, which changes the molecular structure. Tool steels can be softened under heat and forged to the desired designs. They are versatile and have been used for hundreds of years. They also are still undergoing constant improvement, and bid fair to be the principal strength component in wood cutting tools for many years.

The term "cemented tungsten carbide" covers many types of sintered products made by carbide manufacturers in this country and abroad. One

Fig. 1. This view shows type of finish provided by carbide tools. Sample, left, was cut with a steel saw while one at right was cut with a cemented carbide tipped saw.

of its major applications is for use on cutting tools to machine difficult materials, such as the harder metals and stone products; another important adaptation provides saws and cutters for normal and treated wood, where even the best types of tool steel require too frequent sharpening. The type of tungsten carbide used in the wood cutters described here was provided by Carboloy Department of General Electric Company, Detroit, one of the leading companies in this field—with many years of practical experience in such developments. The tools themselves were designed and supplied by several machine manufacturers and tool makers.

Tungsten carbide is not a tough rolled metal that can be forged, heat hardened or annealed. It is a product of powder metallurgy, consisting of 80% to 97% tungsten carbide particles to provide hardness, and 3% to 20% cobalt as the cementing or binding material.

This mixture is formed into any desired shape either by molding in a pill press, cold extrusion, or by cutting in the presintered (comparable to chalk) condition. From the presintered condition the carbide blank is sintered (heated at 1450° Cent.) causing the cobalt to melt, cementing the tungsten carbide particles into the final hardened shape.

There are no hardening or tempering processes required, and after sintering the molded shape can be altered only by grinding. The sintered material is extremely hard, falling in the Rockwell range of 75 to 80A.

To use the hard cutting edge economically, carbide can be brazed to a steel backing. These are customarily called carbide tipped tools. This combination provides a harder cutting edge than tool steel, and is cheaper in most cases than solid carbide. These carbide tips or edges can be brazed to the backing, soldered or attached mechanically. In most instances, worn or broken carbide cutting sections can be removed and new sections brazed in place. This materially reduces the cost of replacements as against making a complete new tool—a necessity when using tool steel.

The expansion of carbide under heat is about half that of tool steel. Hence cutting edges of larger sizes are usually made in segments to minimize the internal stresses when cooling from the heat of brazing.

Carbide tools can be ground by using silicon carbide wheels, diamond wheels, or one of the many new electrolytic grinding processes. While this requires some special equipment, the volume of sharpening is much lessened by the extremely long cutting life of carbide edges. The opportunity to alter cutting contours readily, customary practice with standard tool steel, is not practical with carbides. Most users of carbide tools have set up grinding departments where spare tools can be sent for reconditioning.

Another characteristic of carbide, due to its brittleness, is that cutting edges must be more blunt, i.e., a less acute cutting angle than has been the practice with tool steel. In other words, carbide cutting does not give the degree of

Fig. 2. Carbide tipped saw in action. This saw is sharpened only after eight to ten months of continuous use. Sharpening of a steel saw was a must at least once every one to two weeks.

shear action experienced with steel blades. This, however, is compensated for by the ability of carbide tools to hold their cutting edge longer.

It should be noted that new carbide grades and processes are coming into use, and that sharper cutting edges are in the making. Whether carbide cutting edges can preserve their long cutting life and exhibit the "keep sharpeness" angles of tool steel knives is a problem for the future to solve.

The brittleness of carbide tools requires somewhat more care in handling and storage than do steel tools as will be outlined later. With carbides carelessness can be costly.

The term, "cutting life," may be defined as the number of pieces or the elapsed hours of useful cutting time. When using steel tools, all mechanics are familiar with the gradual deterioration of cutting efficiency, tending either toward rough uneven surfaces, or toward "ironed" surfaces, in which the exposed areas become more or less compacted. Although carbide tools may cut with less shear action than steel, they can maintain cutting edges longer, making this deterioration far less noticeable. Abrasive particles in the wood may ruin a steel knife, but carbides will take most of them in stride.

The proper machining of black walnut gun stocks is an essential factor in the production of firearms. The making of guns dates back to early colonial days, and many apprentices learned their lessons so well that they were in great demand as mechanics. Frequently they were attracted by other and more rapidly growing industries, where they became a distinct factor in improving their operating methods.

Traditional methods survived with astonishing vigor in the firearms industry, and only within recent decades has modern production efficiency and methods been observable. One fact stands out conspicuously. An improvement adopted in a high grade firearms factory, must be "good" to meet and surpass the unusual artisanship that is typical of making guns.

This investigation at New Haven was most heartily promoted by management to permit the Marlin experience with carbide cutters to be passed on to other woodworkers, who might need encouragement to persevere in developing the new tool technique.

The few examples cited here were selected to be a bit out of the ordinary run of woodworking operations, since considerable data on carbides is now in print, for saws, router bits and four-side molders. This use of carbide at Marlin gives a far wider perspective of carbide efficiency than is usually available to woodworkers who are students in the forward looking curriculum.

The sawing of gun stocks is one instance where carbide tips could be replaced, when worn out, at far less cost than making a new tool steel saw.

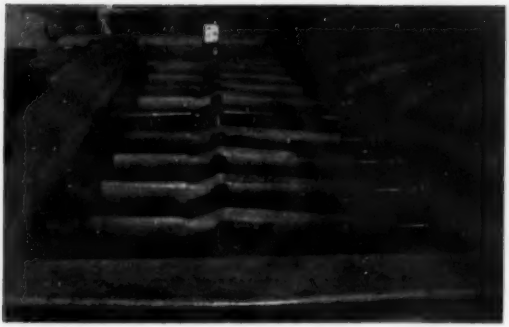

Fig. 3. View of fully loaded Salstrom machine processing black walnut gun stocks. Stocks are machined from rough blanks, samples are at extreme right of machine.

The carbide tips produce a smoother surface of more uniform quality, while the cuts made with the tool steel saw deteriorate appreciably in accuracy and smoothness as the edge became dull. Note Fig. 1. This indicates that in cutting durability the carbide tipped cutter is ten times as effective as the normal tool steel type of cutting blade.

Take, for example, the gun stock blank. It has two parallel flat sides. To mount it singly in the older copying lathe, or in the new multiple turning lathe, as well as to seat the rubber butt plate, it must have accurately machined ends properly bored for the lathe centers and for attachment screws.

The sawing of this butt end is a difficult operation as it is a complete cut across the grain. The saw blade used, Fig. 2, is 16" diameter with 72 teeth. The steel blade had to be sharpened every eight to ten months.

The experience with solid steel saw blades was quite unsatisfactory, even with low production between grindings, as the resulting roughness of the cross grain cut was more like a tear, and required heavy sanding, which inevitably developed dimensional inaccuracies.

These examples of carbide tipped tools required little change in the basic machine equipment employed, and involved only tool modifications.

The case of the stock turning operation we find a complete change in technique, from the turning of single blanks in a follower or copying lathe, to the simultaneous turning of eight blanks in the same time formerly required for a single blank.

In the case of the earlier copying lathe the cutting was done around the blank, and crosswise of the grain of the wood. The cutting nose of the revolving head produced a series of small and rather rough grooves which required a substantial amount of sanding to remove the tool marks. This smoothing step developed hazards of appreciable di-

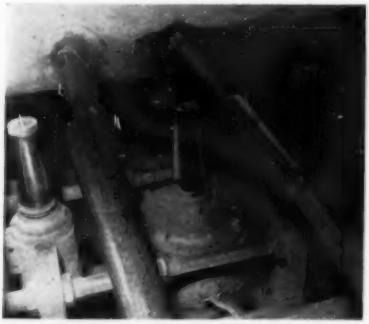

Fig. 4. Machine setup with metal pattern, left, and two spindles with cutters, right.

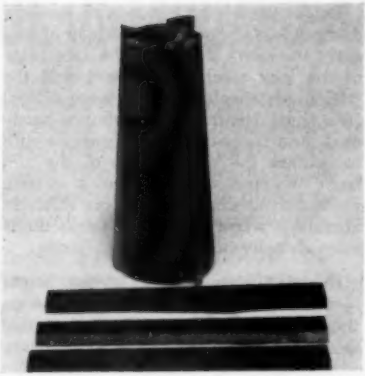

Fig. 5. Three solid Carboloy carbide blades are shown on this cutter. The cutting blades of Carboloy grade 883 are mechanically held in position.

mensional changes, where the abrasive might cut deeper at any soft spots in the wood, and the more or less worn sandpaper tended to clog with shavings and cut unevenly.

At best, cross cutting was more of a tearing action, accentuated when the tool was dull. These cutting noses dulled rapidly and production time was inevitably lost in tool changes, and resetting the cutter heads in proper relation to the pattern. The cutting head was guided into and out of the wood by a pin resting on the metal pattern, which revolved at the same speed as the gun stock blank, so that the turned blank became an exact replica of the pattern. The cutter travels the length of the blank, making helical grooves, in effect a series of minute hills and valleys.

This change in technique consisted in rather substantial modifications in the Salstrom multiple copying machine, which adapted it to the lengthwise (along the grain) turning of gun stock blanks, eight at a time, in one charging of the machine, Fig. 3. The eight blanks are mounted between rotating centers with a central metal pattern, Fig. 4, and at the right, an irregular control bar that slows down the travel of the cutter head carriage at critical spots, where tear outs might occur in the angling grain, as at the pistol grip.

The cutter heads revolve counter clockwise at a constant 7,000 r.p.m. stepped up from normal speed by a frequency changer. These cutter heads are mounted in an overhead traveling carriage and cut as they move away from the observer, being offset from the blank during a quick return stroke.

The blanks revolve slowly, clockwise to the observer and are synchronized with the central metal pattern, against which a guiding roller is pressed. The complete rotation of the pattern is somewhat less than the operating cycle of 15 minutes (on full length standard gun stocks) which allows for loading and unloading the machine in the quarter hour cycle.

It is to be noted that the cut is approximately lengthwise of the grain of the wood, contrasted with the normal lathe cutting across the grain, and the slow revolution of the blanks produces an extremely smooth rounded surface that requires a minimum of sanding.

The time cycle, betwen loading, is about the same for this multiple lathe as for the single copying lathe. A good operator can handle four to six of the large machines and no more than five to six of the single unit type. Hence the man-hour rate of production will be nearly eight times that of the smaller machine.

The cutter blades in this multiple machine are solid carbide, mechanically clamped in the cutter head as in Fig. 5.

The first carbide blades in these Salstrom multiple lathes were placed into production Feb. 17, 1953, and were not

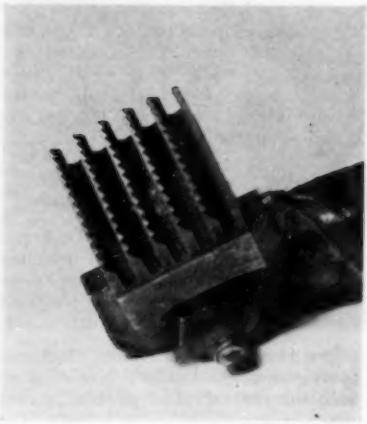

Fig. 6. Closeup of hand checkering tool. Tipped with Carboloy carbide, this tool lasts as long as one year. Steel tools were sharpened at least once a day.

reground until a year later. These original blades are still in service and producing top quality work. Previously, standard tool steel knives had been used in this machine. They had to be resharpened every four days. The carbide blades, however, provide many more months of service before needing sharpening, and the probable tool life is thus many fold that of normal tool steel.

The sanding of turned gun stocks requires an unusual type of tool, one that prevents cutting or wear rather than for the purpose of cutting. One might say, cutting in reverse.

The gun stock, in process, now has been turned, and the recesses in the top and bottom of the stock have been cut out for the reception of the lock mechanism. In the subsequent sanding operation, which is done against an abrasive belt, it is imperative that the recesses be of just the proper depth to accommodate the metal insert, and leave a perfectly smooth surface where the metal and wood meet, edge to edge.

Before the advent of tungsten carbide, dummy metal plates were made of exactly the same shapes as the face plate of the lock mechanism above and the trigger plate below. These were of tool steel, heat treated for maximum hardness, and inserted at the proper depth to protect the wood edges of the slot from wearing away below a certain point during sanding. As more efficient abrasives were developed, these dummies deteriorated faster and faster.

Eventually, someone had the bright idea that of brazing a carbide face on the steel dummy, preserving its original thickness to guard the recesses in the wood gun stock. Thus it developed that a carbide face became useful in preventing cutting by an abrasive.

Rather oddly, in experimenting with more active abrasives, it was discovered that the hardest of the synthetic abrasives used in coating papers and cloths, silicon carbide, did abrade the tungsten carbide protective plates, and could not be used in smoothing gun stocks. However, aluminum oxide, the alternate synthetic abrasive, is nearly the equal of silicon carbide in sharpness, hardness and durability, and proved entirely satisfactory in sanding gun stocks.

The cutting life data on these protective carbide plates is shown in an accompanying table.

The hand grip, on the under side of the gun stock, is hand tooled to steady the trigger finger. Metal workers would call it knurling. The wood grip has such an unusual curved contour that it cannot be done mechanically, and this shape varies in different types of gun stocks.

This hand tooling, or checkering, is a highly skilled job, requiring a steady hand, good eyesight and calm nerves, almost approaching the technique of an expert engraver. The tempered steel tool, with small pointed teeth, is care-

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Fig. 7. Checkering tool in action. Note uniformity of the work.

fully drawn over the convex curved surfaces of the hand grip, making a series of parallel triangular grooves in the wood.

The tool, Fig. 6, with its pointed edges is a miniature of the old-fashioned curry comb of the horse and buggy days or might be compared to a small section of a dozen teeth from a conventional hand saw. These grooves are 1/16" or 1/8" apart, and the corresponding series of cross grooves leave small raised diamond points or projections, about twice as high as they are wide. The tool must be sharp enough to cut, rather than to tear the wood, and must not destroy the symmetry of the diamond shapes. It is important that the grooves be accurately spaced, so that successive strokes of the tool produce a uniform appearance over the entire checkered surface. Note Fig. 7.

These tempered steel checkering tools required sharpening at least once a day, and it was practically impossible to preserve the regularity and uniformity of the spacing between the teeth. Consequently, the tools often had to be discarded long before they were worn out.

The change to checkering tools with brazed carbide tips was little less than a miracle. The carbide tools were serviceable for 8 to 12 months before any sharpening was required. Since this grinding was on the side of the teeth, rather than in the gullets, the teeth maintained their accurate spacing and shape.

The operator, who formerly took an hour or more a day to recondition his tools, was freed for full productive work. The comparative results are shown in one of the tables.

It is believed that this is an outstanding example of carbide efficiency, considerably better than 12-fold when the difference in price is considered. Carbide cutting tools are almost always associated with high speed cutting, but here is an example where speed is not a factor, and far smoother cutting and more uniform spacing can be credited to carbide tools.

The face of the hand tool, somewhat enlarged, is shown clearly in Fig. 6. The beauty and artisanship of this

Hand Grooving or Checking

Characteristic	Tool Steel	Carbide Teeth
Length of useful life	1 day	8 - 12 mos.
Operating life ratio	1	250 up
Initial tool cost ratio	1	12
Sharpening time	40	1

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Characteristic	Tool Steel	Carbide Faces
Length of Useful Life	6 wks	3 yrs., still good
Operating Life Ratio	1 wk.	26 yrs. plus
Initial Tool Cost	1 wk.	3 yrs.

checkering is well illustrated in Fig. 7. Is it any wonder that such an attractively grained and checkered gun stock gives a heart throb to its sportsman owner?

The carbide applications described above, cover a wide range of cutting techniques, and comparisons of unlike operations cannot be wholly consistent. Another accompanying table clearly demonstrates the superiority of carbide tools in a variety of wood cutting operations.

The improvement in the quality of the cut cannot be shown statistically, but the superiority of the carbide cutter, in both cost and cutting life, is most significant.

Carbide cutters are particularly delicate and may easily be ruined by a sharp rap, or by dropping even a short distance. In contrast to tool steel cutters they are distinctly fragile. Their cost, is from 3 to 12 times that of their predecessors, and consideration for their safe handling should be in the same ratio.

For the larger carbide tools, individual storage boxes should be provided, in which the tools can be locked fast, with padding for all carbide edges. Tools should be removed from such boxes only at the machine, when ready to install. Smaller tools may be stored in pigeon holes or placed on wooden pins, but should be wrapped in padding for carrying or laying on work benches.

The need of meticulous care in storage and handling cannot be emphasized too strongly.

The performance of early carbide tools in some wood operations was so phenomenal that many in the woodworking industry felt it was an easy cure for all wood cutting difficulties; that a change to a carbide tipped tool was all that was necessary, regardless of all other machine factors. Such is not the fact.

Comparative Summary of Wood Cutting Operations

Operation	Grain Relation of Cut	Operating Ratio	Cost Ratio	Speed Lin. Ft. Per Min.
1. Profiling top edge	With	1/10+	1/4	6,900
2. Milling butt plate	Across	1/24	1/12	8,900
3. Single lathe	Across	?	?	?
Multiple lathe	With	X	X	3,200
4. Sanding plate	Across	1/13+	1/3	?
5. Hand checking	.....	1/150+	1/12	* * * *
6. Back knife lathe	Across	1/10	1/7	?
7. Slotting short stock	Across	X	X	10,500

X=New developments, comparisons not available.

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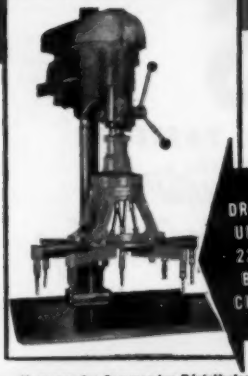

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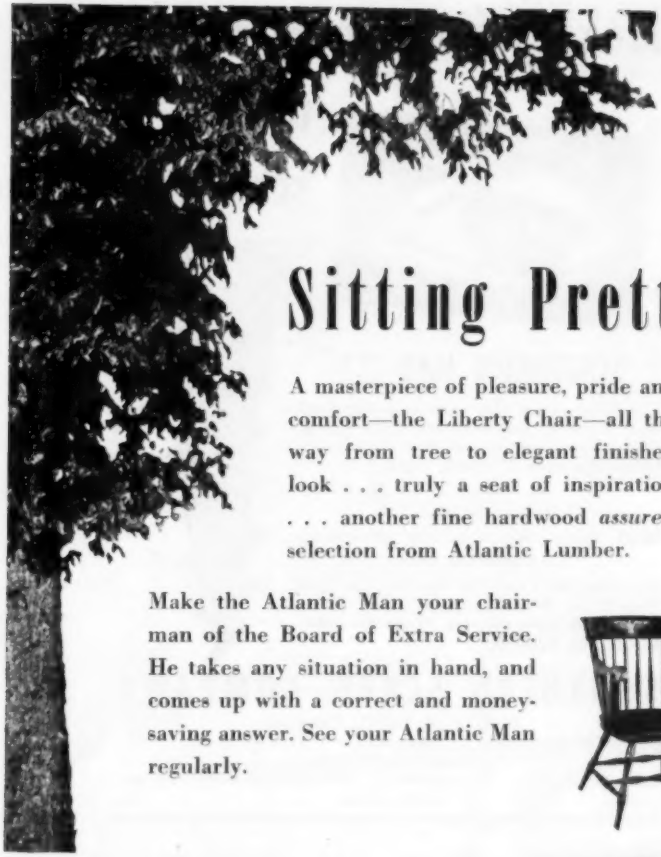

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MAHOGANY

•

By George Lamb

MAHOGANY is an amazing wood in many ways. Ever since it became well known, men in the mahogany business have been predicting that the end of the supply was just around the corner. English speaking people first learned of mahogany that was imported from Jamaica and that source really did run out. However, other West Indian islands, principally Santo Domingo and Cuba, carried on the supply for many years.

To make a long story short, the scene of production shifted to the mainland, centering in Honduras but spreading from southern Mexico to the Isthmus of Panama. This area is still a good mahogany production region and will continue to produce excellent material for many years to come but it couldn't begin to furnish today's demand for mahogany lumber and veneer.

About 50 years ago the West Coast of Africa opened up as a source of mahogany which has grown to be the number one spot in volume. The supplies of this region are not inexhaustible but better forest management at this time will tend to defer serious depletion of mahogany timber almost indefinitely. Another factor that will prolong Mahogany supplies is the much greater use of secondary woods principally by European countries. In fact, this utilization has largely replaced the thriving American hardwood export business in Europe.

We also have another source of mahogany that may well prove the greatest of all. This is on the upper Amazon in western Brazil and eastern Peru. This belt of mahogany producing may be as much as 2,000 miles long and 1,000 miles wide. This huge area is comparatively unknown, but it is very likely that in its hidden jungles there will be found the greatest of all the mahogany reserves. The production in this region is confined to a few million feet a year. This production will not increase rapidly because distances are great and transportation problems difficult.

Mahogany keeps rolling along because of its comparative availability and also because of new markets. The advent of the phonograph, radio and now television, with a couple of wars

Modern dining group in choice mahogany, finished in the Imperial Furniture Company's "Charal," a warm tone.

and a large police action, have produced good markets for mahogany. While furniture always has been the bread and butter business, these other things have furnished the extra demand that has made the difference between fair and excellent business. Then, we should not overlook such mahogany markets as architectural woodwork, boat building, foundry patterns, caskets, musical instruments, clocks and many other items.

We mentioned the use of secondary woods in Europe and this most likely brings up the question as to why this country does not use more of this type of timber. One obvious answer is that we have substantial supplies of our own fine hardwoods. As long as we have them, it will be extremely difficult for secondary tropical trees to compete in price. Actually secondary tropical woods cost almost as much as mahogany. The cost of getting these logs to seaboard and across the ocean would be practically the same as the mahogany costs. Logging costs might be somewhat less than logging mahogany if the secondary trees in question were considerably more numerous in the forest. Such saving, however, could be dissipated very quickly if the secondary woods yielded lower grades than mahogany. Few of the tropical trees do yield as well as mahogany, which is famous for its freedom from defect.

Speaking of defects, the mahogany industry has been shouting from the house tops, "Look at our mahogany, long and wide and not a pimple on it." With this reputation the volume buyers of mahogany lumber, and especially veneer, object to every little pin-knot, gum streak or swirl that appears, which on other woods, would be enchantingly beautiful. What if the old mahogany does carry some scars of a long and arduous jungle fight for existence. They are honorable scars. Nature's imperfections often are beautiful and give more character and interest to a surface than repetitious regularity can ever provide. It's about time that mahogany became just a little less formal and considerably more casual in appearance.

Before World War II the native woods generally carried a substantial price advantage over mahogany but this advantage has been disappearing in the past several years. This has been due to the fact that mahogany prices have not gone up while the prices of native woods have advanced very sharply. Back in the 1920's both mahogany lumber and mahogany veneer were considerably higher than they are today. In fact, mahogany veneers today are the cheapest on the market and would continue to be, even if advancing tropical costs should force a substantial percentage-wise advance in prices. So far, the key to the holding down of mahogany costs has been the almost complete mechanization of tropical operations, and the fact that mahogany trees come large and clear, thus the production of mahogany veneer per hour or per day, greatly exceeds that of our native veneer woods and most of the tropical woods as well.

It is interesting to note that currently mahogany makes up between 35% and

40% of all the "face" veneers produced and used in this country. The furniture, television and architectural woodwork industries account for the major part of this production. The popularity of mahogany is even more apparent when it is realized that the use of mahogany veneers is about 2½ times that of the native wood that vies with mahogany as a fine cabinet wood.

It might be well to inquire at this time just why mahogany has such a high ranking as a cabinet wood, both in the forms of lumber and veneer. Maybe the reasons for this excellence can be stated in a single sentence. Here goes, so take a big breath—it may be a long one: "Mahogany is the one cabinet wood that has an ideal combination of physical and woodworking characteristics, ease of drying and finishing potentials combined with wide variety and lasting beauty that is available in quantity at a reasonable price."

What is the outlook for mahogany furniture in the near future? What are the trends? The furniture industry is in the midst of an evolutionary process that has been developing for a number of years. Not many years ago mahogany was confined to 18th century English or American styles. More often than not the firms producing these styles made nothing or little else. Over a score of years, styles progressed from the most ornate of Chippendale to modified Chippendale, Hepplewhite, Sheraton, Federal American and English Regency. Today, traditional styles have expanded to include French Provincial and into various modifications of Provincial that have acquired certain aspects of Early American and even with touches of Modern.

The greatest trend of all, of course, has been Modern, or contemporary. Neither is a perfect name but they will have to suffice since the prophets give no inkling as to what it will be called a hundred years from now. Since this type of design has no historical precedent it has widened the number of furniture woods both native and tropical. There also has been a strong tendency to lighter woods and lighter finishes.

Overlaid with finely selected swirl veneers, this knee hole desk is of Honduras mahogany.

Where does that leave mahogany? Strangely enough mahogany is doing all right and the outlook is for even better business. There still is plenty of mahogany traditional on the market and it sells extremely well. One national authority has mentioned that replacement buying is the heart of retail furniture business and mahogany gets an awfully big chunk of that business. Mahogany traditional comes to market today all dressed up in a lot of new finishes in a wide range of browns and amber tones. These bring out the depth and the play of lights and shadows for which mahogany is without a peer.

In the early Modern mahogany showed up in quantity but almost exclusively in bleached finishes. These still persist but to them have been added pigmented finishes that still show the grain of the wood; and, at their best,

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present a very acceptable appearance. The important trend in mahogany Modern has been to the honey tones. Many of these bring out the full play of light and shadows. They are cabinet woods at their best.

There has been a strong pickup in mahogany Modern, not only in the upper price brackets but well down through the medium price ranges. Those who think and sometimes hope that mahogany is on the skids should note that wide dispersal of mahogany furniture production has replaced scattered concentrated production.

It is obvious that the cabinetmakers of today have the same high regard for mahogany as was manifested by designers and cabinetmakers of the 18th century. Also, it should be remembered that there is a lot of solid mahogany furniture being made. It ranges from a group here and there to production firms that make solid mahogany exclusively.

Throughout literature for many generations and very prevalent today, one finds references to mahogany as connoting, affluence, social position, quality and gracious living. This all adds up to just one thing—mahogany is and will continue to be the world's leading cabinet wood. It is the magic word that closes a sale and makes another satisfied customer.

TREE FARMS

The beauty and glamour of West Coast tree farms has been captured in a new full-color booklet just released by the Industrial Forestry Association, 1410 S.W. Morrison, Portland 5, Ore.

There are now 203 tree farms in the Douglas fir region of western Washington and Oregon, the forest leader stated, with a total area of 4,266,633 acres. Washington has 129 tree farms totaling 2,601,405 acres, and Oregon's 74 tree farms embrace 1,665,228 acres.

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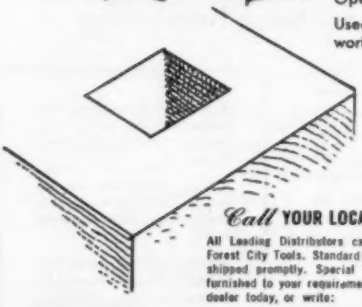

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The E. A. Stewart Company of Texarkana, U. S. A.

By Ned Bailey

AS I said in my previous article about this trip to Texarkana and the E. A. Stewart Company it might develop into several articles, and it has. Before, I wrote mostly about the LeTourneau's timber harvesting equipment that was cutting thousands of fine oaks for the E. A. Stewart Company. This, and the timber coming from other Stewart timber tracts goes to the mill whose equipment is best suited to cutting it for its end use.

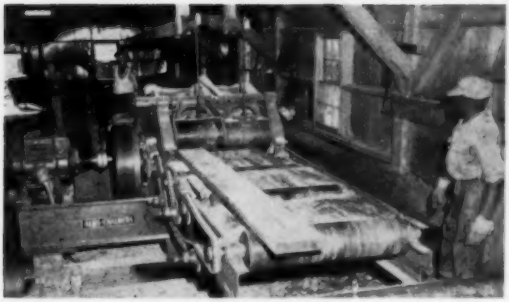
One of these mills, not far from the main plant in Texarkana, is where they cut ties and heavy lumber. This sawmill is where Charles Stewart, husky, competent son of E. A. Stewart, is superintendent. The logs are brought to the mill on company owned trucks. They are unloaded near enough the big boom at the mill site so that the boom can pick them up and drop them in the delivery trough when they are wanted.

The boom, pictures in this article, was designed and constructed by Stewart engineers and is remarkable in many ways. Under the guidance of a very competent operator it can "pick'em up and lay'em down" about anywhere. It reaches out over a wide radius and the wire rope, at the end of which are two grappling tackle at the ends of which are sharp hooks, pick up two or three logs at a time. Under directions from the handler, stationed at the delivery trough, the engineer operating the boom drops the logs into the delivery trough. This trough or water tank is a long narrow concrete affair and connects with the bottom of a conveyor which carries the logs up into the mill.

When the logs arrive at the top of the conveyor they are rolled off sideways onto a platform where they are held until the saw is ready to take them.

When ready for sawing a new log the

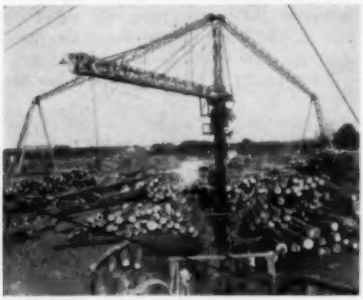
Acres and acres of fine oak lumber being air dried on stick preparatory to going into the Moore dry kiln.



Here is the Allis-Chalmers planer working on rough lumber.

big Allis-Chalmers rig fastens onto the log and the operator moves the carriage to the blade. The outer cuts are made and the bark slab carried away on a conveyor at the other end of the rig. Then the cuts are made to bring the log down to tie dimensions. These cuts produce rough lumber which is sold as such or sent to the flooring mill for finishing.

After the ties are squared and cut to length they are taken off the right side of the conveyor and moved down to a large storage platform and from there they are loaded into freight cars.



This Stewart designed boom is surrounded by recently delivered timber which it picks up and places in the delivery trough. This water filled trough or tank can be seen lower center of the picture. To the left is a load of logs being swung over to the trough.

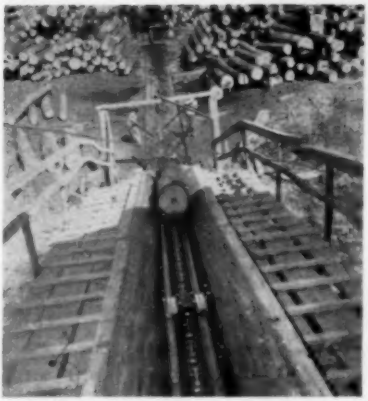
Logs about to be dropped into trough. It is surprising how rapidly the piles of logs disappear into the mill only to be replaced by others.

The slabs and rough lumber are taken off the conveyor on the left side opposite where the ties are removed and further along the deck.

The slabs are piled on the ground at the end of and below the deck. These and the sawdust are used for fuel.

The rough lumber is run through a resaw and planer, then removed to the drying yard. And what a yard, it covers acres permitting a good long time for air drying.

Chain conveyor which carries boards to the sorting and piling department.



Looking down on the conveyor that picks up the logs at the end of the delivery trough and carries them up into the mill.

At first glance this operation looked a bit crude to me, but after I had a chance to study it I found it was very well planned and carried out. It was a real surprise to see the tremendous amount of work accomplished by a few men. Charlie Stewart is always on the job to see that things run smoothly. Most of the power used is compressed air because he says "you can control compressed air so that it can do about any job we want done around here!"

Bringing the logs to the top floor of the mill make gravity operations possible from there on. The ties, slabs and rough lumber are all handled by gravity to the places where truck or freight train can carry them away.

They tell a little story about Charlie, who I'm inclined to believe is a practical joker. The story concerns a certain merchant in town who was in a bit of a hurry to get a bill paid so Charlie wrote out a check on a railroad tie and delivered it to the gentleman.

Logs lined up waiting their turn to be cut into ties and rough lumber. There is a partially cut log on the saw carriage and one held by "dogs" ready to be turned onto the carriage at the proper time. Air dogs from Flier & Sowell, Menominee, Wis. "Nigger and kicker" on Allis-Chalmers timber carrier.

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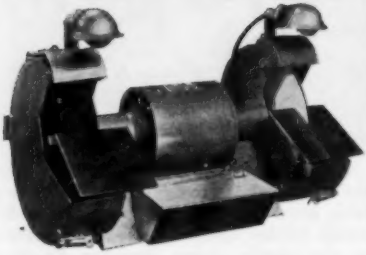

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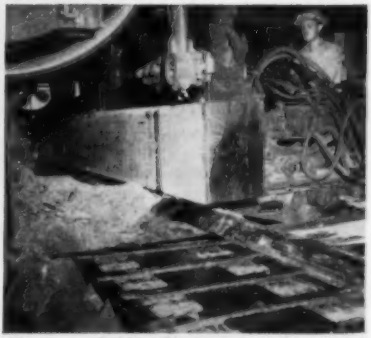

Close-up of Allis Chalmers six foot band mill. The "carrier" and other equipment is all air controlled.

At first the man didn't want to take it, then he saw publicity opportunities in cashing it. He arranged with the newspaper to be on hand when he cashed it. He slid the tie through the paying teller's window and got his money.

Subsequently he received a bill from the paper for "publicity expense" and one from the bank for scratching the teller's desk.

Saw carriage and saw-cut coming to end of the run.

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XJSW—with extended table at right

XJSW—with J-430 extended sliding table at left

XJW—with J-420 removable roll-table at left

Evolution of LUMBER DRYING TECHNIQUES and DRY KILNS

Part 7

By Paul H. Graham

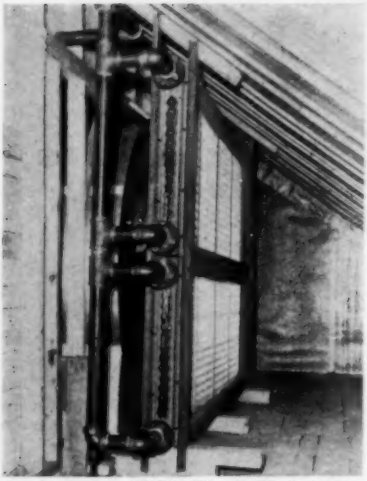
COMPARTMENT dry kilns also have either natural or forced circulation but are more flexible and adaptable for drying of difficult species and thicknesses of lumber, and provide better control for drying refractory woods. Control of circulation generally is more efficient than that of progressive kilns. In the modern compartment dry kiln, within limits of the various circulation systems, approximately the same temperature and humidity prevail throughout the kiln at any given time, beginning with relatively mild conditions and increasing in severity as the lumber becomes progressively drier.

The general trend toward the use of compartment kilns for drying lumber came about because of : 1) more rigid requirements provided by more exacting wood products manufacturing conditions; 2) the need for greater flexibility of operation and control of drying conditions in the kiln; 3) the requirement of adequate capacity to suit drying needs of various species and different thicknesses and refractory woods; and 4) desire to minimize change in temperature, humidity and circulation inside the kiln with outside variations in wind and weather.

The first compartment kiln developed was the natural-circulation kiln, otherwise known as the "natural-draft," "ventilated" or "gravity" kiln. In the earlier kilns heating coils were installed in the floor of the kiln under the lumber piles with the expectation that the heated air would circulate up through the load to dry the lumber.

As explained by one of the early dry kiln manufacturers, "Circulation in this kiln is natural. The heating coils continually heat the air, and evaporation of moisture from the wood and heat losses through the building walls and roof continually cool the air. The heated air rises. Some of it escapes through cracks at the top of the kiln, and the rest of it enters the lumber where it is cooled as it picks up moisture. The cooled air drops and is recirculated over the heated coils until it is warm enough to rise again."

This circulation system, however, did not always work out exactly according to plan. Heat supplied by the steam pipes caused the air to move but not always through the lumber load. The amount of circulation was limited and resulted in slow, uneven drying. To remedy this condition ventilating flues were then provided along the length of the kiln on both sides for cross circulation, with their outlets made at different heights and in various arrangements. Chimneys were used to aid in vertical movement of the air and inlet



Courtesy: R. M. McGlauflin, Crosby & Siegars, Inc., Portland, Me.

A 36" Hartzell Reversible Propeller Fan provides air delivery of approximately 20,000 cfm at free air with 2 h.p. motor.

openings or ducts were located in various parts of the kiln.

One kiln manufacturer described the benefits of his improved dry kiln design in the following fashion: "The most important part of our system and its operation is the construction of our flues in combination with our patented moisture regulators, as these and air ducts control our circulation. Our flues are radically different from those used in other makes of kilns. They are of the down draft type. Openings into flues are located in sides of the kiln near the top of the side walls. Discharge openings are several feet down on the outside, where hood regulators are used, but where flat regulators are used in the lower openings, instead of discharging to the open air, discharge into an upright flue and moisture is carried up above the roof of the kiln.

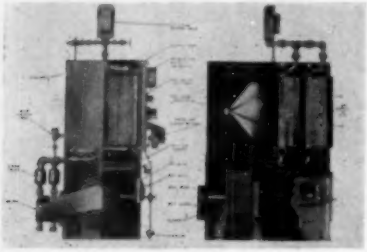
"This arrangement of flues, together with the placing of the automatic moisture regulators, confines the heated, humid air in the kiln, not allowing any to escape except where moisture laden. In up drafts this cannot be accomplished no matter how tightly dampered.

"When pressure in the kiln opens the regulators, the outside air, being of a lower temperature, increases the circulation through the flues tending to quickly remove the moisture laden air, its place being taken by fresh air from air ducts at the bottom of the kiln. The regulators act in the same manner as a check valve so no air can enter the kiln from the outside and pass into flues on account of these regulators and heavier air in the kiln."

When intakes and vents were provided and desired results were not obtained, attention was given to various methods of piling the lumber for drying. Lumber was first piled with a straight flue or chimney formed through the pile from bottom to top. With this stacking arrangement most of the air by-passed to the sides of the pile so that it failed to reach the lumber in the center. Other stacking methods were tried and one which proved quite successful required a spacing of about 2" between the boards on each course for the lower half of the stack, and a 1" spacing between the boards for the upper half. The flue or chimney in the center of the stack extended up to the second course from the top, with an opening of about 18" at the bottom decreasing gradually to an opening of about 1" at the top.

It is claimed that all the various improvements: inlets, vents, chimneys, ducts and dampers, served to increase natural circulation of the kiln. Being warmer than the surrounding atmosphere, it was believed the kiln acted as a chimney and the draft created increased the natural circulation. Circulation, however, was still dependent

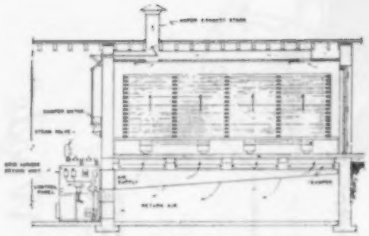
primarily upon the draft of the stack and seldom averaged more than 16 f.p.m. It was also felt that the addition of steam spray lines and baffles provided improved circulation and that steam jets located in intake and outlet flues made valuable contributions. Arguments were advanced that the outlet jet installation increased circulation through exhaustion of air from the kiln and jets in the intakes served to humidify and preheat the air as well as inducing circulation.



Operating components of Grid Lumber Drying Unit.

It may be said generally that it was ventilation mainly which was increased and this increased ventilation did not effectively increase circulation within the loads, even when heating pipes and jets were put in the vents. The main effect the steam jets produced was to stimulate circulation when properly placed in relation to the loads, but not when the jets were put in the vents or fresh air intake.

A kiln manufactured during this period featured an "accelerated controlled draft" which was said to be obtained by means of a system of aspirators installed in the exhaust stacks of the kiln to obtain a uniformly rapid circulation of air in the kiln. Fresh air flues and exhaust air vents were varied in size and number, depending upon dimensions of kilns. Another make of dry kiln used a steam radiator in the form of a single length of pipe running



Courtesy: D. J. Murray Manufacturing Co., Wausau, Wisconsin.

Schematic sketch of Grid Lumber Dryer layout.

full length of the chimney which produced an upward draft of air in the chimney by heating the air.

What has been regarded as an important stage in dry kiln development was the introduction of the condenser kilns. In these kilns steam sprays were replaced by condensers which served to cool the air and at the same time removed some of the moisture from it. (This does not refer to steam sprays now used to provide humidity in modern kilns.) The cooled air then fell and passed to the heating coils as fast as the hot air rose from the coils. This natural system of recirculation did not depend upon changing the air in the kiln to remove the moisture evaporated from the wood.

Condensers had a two-fold purpose: to aid in producing circulation, and to reduce humidity in the kiln. As described by Rolf Thelen in the F.P.L. "Kiln Drying Handbook," (Dept. Bulletin No. 1136), published in 1923:

"Condensers if properly located will assist materially in producing circulation, and will also reduce humidity. If air is being continuously heated at one point in a confined space and continuously cooled at another point, there will be a continuous flow of air downward at the second point. There will also be cross-circulation between the two points, the warmed air above flowing from the hot point to the cold one

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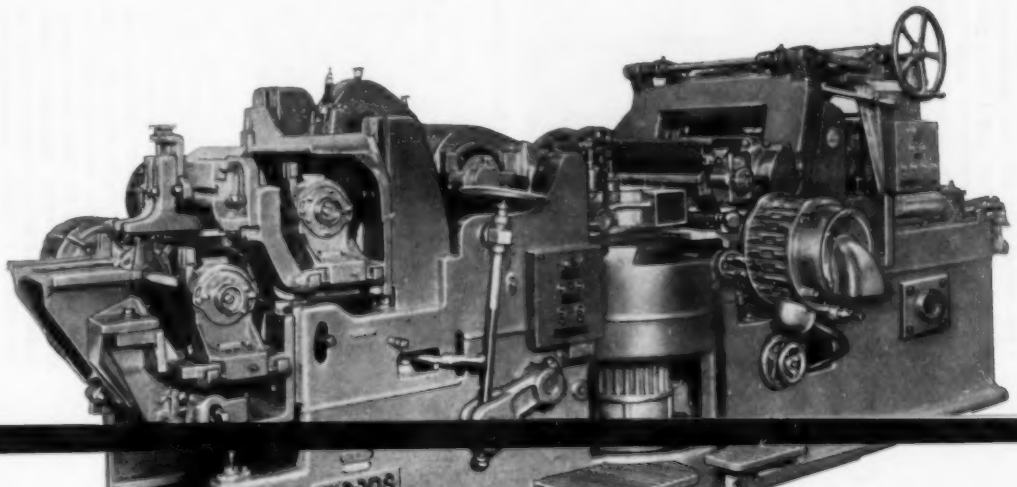

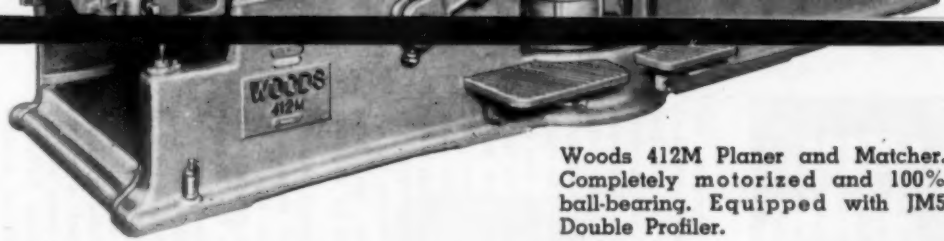

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and the cold air below flowing from the cold point to the hot one. Condensers may well act as the cooling agent and the steam coils as the suppliers of heat."

In most of these condenser kilns a pipe coil was used on the kiln wall through which cold water was passed. The amount of cold water passing through the pipes regulated humidity and their cooling effect caused a down draft of air to aid in pulling heated air through the lumber load. Since these kilns did not require absolutely fresh intake air or ventilation, many were not equipped with chimneys or stacks, but better results were reported in kilns where the condenser system was used in combination with ventilation. Their general application was somewhat limited by cost of water and difficulty of accurate control.

The condenser was devised chiefly to reduce humidity and placed to assist natural circulation. Commenting on a statement to the effect that condenser kilns constituted the ultimate refinement of the natural-circulation kiln, a leading kiln drying authority wrote: "Regarding ultimate refinement in natural circulation kilns, this came when they shut off the condensers and knocked a hole in the roof to make them 'vented' kilns. The vented kiln was the improvement."

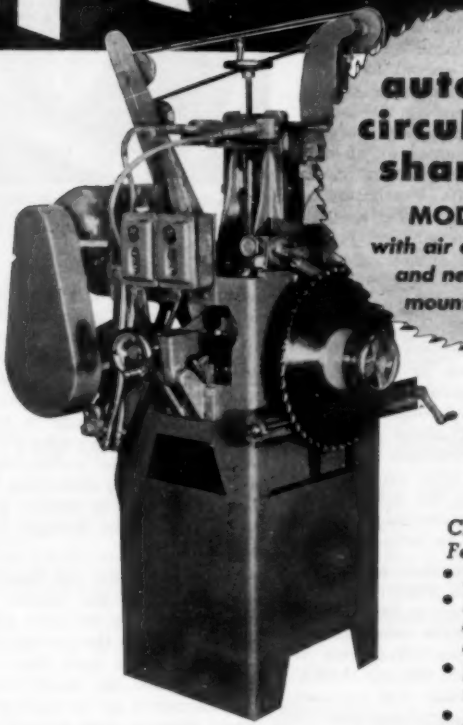
There is some disagreement as to classification of the water spray kiln but many authorities included it in the forced-circulation kiln classification because mechanical action of the water spray was used for air movement. All agree, however, that this kiln design stands out as the unit which provided the way for all modern improvements. It proved the value of humidity control in reducing seasoning degrade, and gave birth to the idea and economic possibility of kiln drying green from the saw.

Condensing coils were generally used on the kiln walls in these kilns, which led them to be also known as water spray condenser kilns. Like the condensers, cool water sprays served as a cooling agent for humidity control and in combination with the heating source of the kiln provided a good recirculating system. Additional stimulation to circulation was provided by the impact of the water spray on the air and a system of baffles aided in proper direction of air movement.

In water spray kiln operation the colder water temperature combined with movement caused by the spray and condensation of evaporated moisture from the lumber, caused a downward pull of the air currents. Colder water was required for lower relative humidities and greater circulation. The original Tiemann water spray kiln was designed for the conditioned air to leave the water spray chamber at dew point, and was said to operate with dew point control. In most water spray kilns water was returned to a tank, in which water was regulated to suit temperature requirements of the kiln, usually by adding enough cold water, and from which it was recirculated by a pump.

In water spray condenser kilns a single row of condenser steam coils were often used on either side of the kiln to aid in removing excess moisture from the air. When the kiln run progressed to a point where low humidities became more important than circulation, the sprays were often shut off and the condenser coils along the side walls were used. In some of these kilns a system of ventilation replaced the condensers. The chief objections to the water spray kiln were the excessive load on the heating, difficulty of control for low moisture content drying, and excessive water cost. It was, however, one of the first dry kilns to provide adequate control of circulation and humidity in the kiln

HANCHETT



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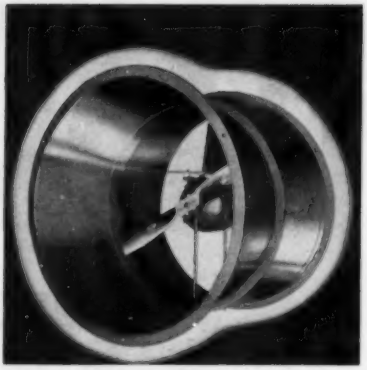
but air velocity obtained seldom exceeded 25 f.p.m.

Forced-circulation compartment kilns, other than water spray kilns, used mechanical means directly to provide required air circulation in the kiln. Circulation of the various systems is provided by means of fans located within the kilns in different arrangements for longitudinal or cross-wise flow, or by blowers usually placed outside the kiln chamber, which served to recirculate air through a series of supply and return ducts extending the length of the kiln. They are variously operated direct from steam engines or electric motors or may be driven from power transmission line shafts. Ventilation of some sort is usually provided to vent excess moisture laden air and provision is made for the supply of fresh replacement air in most forced-circulation dry kiln systems.

Many forced-circulation kiln designs were developed for the recirculation of the same air as much as possible on the theory that recirculation air requires heating only through a range of about 20 degrees, while fresh air must be heated from outdoor temperature to the required kiln temperature. The clincher line for the sale of one of the earlier commercial forced-circulation kilns used to be:

"When you realize that about six times as much steam is required to heat fresh air from 0-degrees to 120-degrees Fahrenheit as to raise the same volume of recirculated air from 100-degrees to 120-degrees Fahrenheit, you can readily see the enormous savings that are possible when a minimum of fresh air is introduced, as in our kiln."

The general efficiency of forced-circulation internal-fan circulation systems is probably best attested to by the number of natural-circulation kilns which have been converted to internal-fan kilns. In some of these systems fans used for circulation serve double duty



Fan and heating coil unit installation in internal-fan kiln. Air from fan blows through heating coil down into plenum chambers on either side.

as exhaust fans, taking in and discharging air through vents located at both vacuum and pressure sides: others use a separate fan and motor for this purpose, operated by automatic control of thermostat or hygrostat instruments. Since air from the pressure side of fans has a tendency to travel in a direct straight line, it has been found necessary in some circulation systems to provide ducts, deflecting baffles or plenum chamber to confine major drying air movement through the lumber load.

Provisions have also been made to compensate for the natural tendency for air to follow the path of least resistance back to the suction side of the fans. Reversible type fans have also been provided for most kiln installations to permit air to be directed alternately through first one side and then the other side of the lumber load. Automatic time reversing control is usually provided, which automatically reverses the direction of the fan system electrically, instead of manually, to reverse air flow at regularly predetermined intervals during the entire kiln run.

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Conventional internal-fan kiln designs usually incorporated either longitudinal flow or cross flow circulation systems, both being equipped for reversible circulation, which have become commonly known as long-shaft or longitudinal-shaft kilns and short-shaft or cross-shaft kilns. The main difference between the two systems has been in the arrangement of the fans. These kilns usually incorporate a steam spray humidifying system, steam coils or other heating sources, and various ventilating devices. In their operation the fans force the air through heating and humidifying agencies and on through the lumber load, returning most of it to the fans for recirculation with fresh make-up air being provided and ventilation exhausting the excess moisture laden air.

Disc fans are commonly used although special fan designs have been developed to meet special installation and kiln operation requirements. One of the major fields of development has been in fans and fan arrangements that will produce a reasonably high air velocity through the lumber load in a uniform flow with a minimum horsepower requirement. Various designs and sizes of fans have been tried in different arrangements, with a range of fan sizes of 36", 42" and 48" being most commonly adopted. Fans as large as 60" have been used with good results and some as large as 72" were reported in use where low cost power was available and extremely high air velocity was required. The size limitation for fan installations seemed to be based primarily upon economic considerations rather than operational difficulties.

"Here! Strap this on you, Figpod, it will keep you from going to the water cooler all the time!"

Fans were found located above, under or at the sides of the lumber load. The reason advanced for the many internal-fan kilns observed operating with fans located under the load involved conversion of many natural-circulation kilns, in which the internal-fan circulation system has proved to be a most efficient and economical installation. The other types of fan installation (above or at the sides of the load) were said to be generally favored for new dry kilns because of their lower installation cost. In these installations the fans were mounted on single long shafts driven by a motor outside the kiln chamber, on individual shafts driven by motors mounted outside of the kiln, or directly connected to moisture-resistant motors with heat-resistant windings inside the kiln.

Various methods were found being used to calculate capacity and number of fans required for the individual kiln installation circulation system. One that seemed to be quite popular was that reported by A. J. Panshin, of Michigan State College, in his report, "Lumber Dry Kilns and Their Operation," published June 1949 as Special Bulletin 359 which advises:

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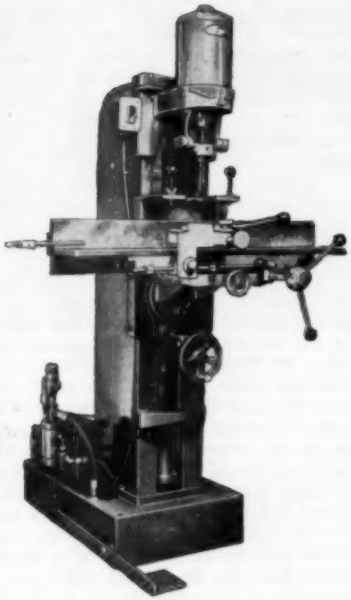

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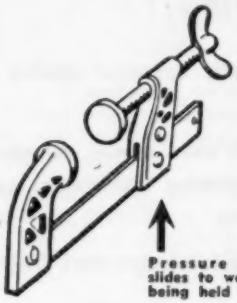

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"The fan capacity required for a kiln of certain size can be calculated by assuming the maximum rate of circulation desired in the kiln. For instance, assume a kiln with a capacity for one stack of 4/4" lumber 8' wide, 16' long and 10' high. The stickers used for separating the layers of lumber are one inch thick. It is desired to have 350 f.p.m. circulation through the lumber pile. The air that does the actual drying must pass between the courses of lumber, i.e., it must pass through the channels in the lumber stack made by the stickers. Each of these openings measures 1" x 16', or 1-1/3 square feet. In a stack of lumber 10' high there are 60 such openings. Therefore the total area occupied by the open spaces through which the air can move is 1-1/3 x 60, or 80 square feet. Since a rate of circulation of 350 feet is required, 80 x 350, or 28,000 cubic feet of air is needed to produce this circulation.

"The number of fans required to obtain uniform circulation throughout the kiln is determined largely by the length of the building. For a kiln measuring 18' x 20', three fans will be desirable, although two fans can be used. In choosing fans, losses in delivery due to static pressure and tendency of some air to go around rather than through the load should be compensated by increasing the required delivery rate by about 33.3%. For instance, if each fan is expected to deliver 9,333 cubic feet of air through the load (a total of 28,000 cubic feet per three fans), the rated capacity of each fan should be 33.3% greater, or approximately 12,500 cubic feet."

The long-shaft or longitudinal-shaft kiln internal-fan system has a number of fans arranged in a long shaft to extend lengthwise of the kiln, and the shaft is driven by a reversible motor mounted outside the kiln, and a combination duct and baffling system aided by the use of left hand and right hand

BUSS No. 44

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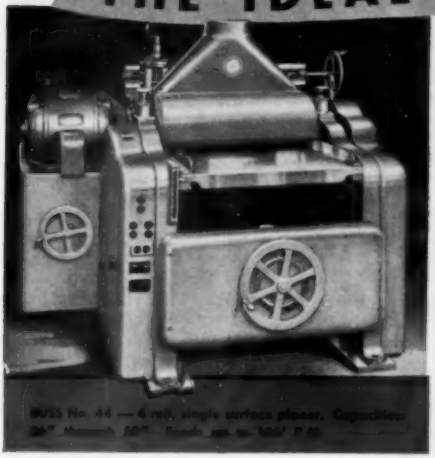

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- Lower rolls and pressure bar are instantly adjustable at the flick of a lever — providing great time-saving and accuracy.
- Drop-forged steel infeed roll sections are unbreakable.
- Cutterhead and feed motors are of extra heavy duty capacity.
- Positive protection is provided against lumber jamming or blocking of feed mechanism.

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fans provide both longitudinal and transverse circulation. Ventilators are usually used before and behind the fans to serve alternately as intakes or outlets. Baffles are used not only for deflection of the initial longitudinal flow to a transverse direction, but also to baffle the lumber load to prevent shorting or short-circuiting in some kiln systems.

Air circulation in these long-shaft internal-fan systems is generally from the fans across the heating coils and then takes a path either upward or downward, depending upon location of the fans, across through the lumber load and back to the fans. Some kiln systems of this type use diagonal baffling between the fans, with the angle of the baffles usually controlling the degree of longitudinal movement and opposing right and left hand fans at the switching or change-over point breaking up the longitudinal air movement for transverse circulation. Other kiln systems depend mainly upon air duct systems for uniform circulation through the lumber, with air movement circling from top to bottom of the kiln loads.

A common fan arrangement for double track kilns features alternately opposing fans, so that right hand and left hand fans are always blowing against each other regardless of which direction the fan shaft is rotated. Baffling is generally used to air transverse circulation. During the development of forced circulation kilns considerable difficulty was experienced with temperature drop between two loads. This brought about the use of booster or reheating coils between the two loads to compensate for the temperature drop so that more uniform and faster drying could be obtained. Approximately the same result may be obtained by doubling the air volume, but this necessarily increases fan operation and power cost, often con-

Note how the brushes force the abrasive cloth down into the grooves.

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siderably more than the cost of the booster coil.

In its early form all air was circulated up between the tracks of the double track kiln, with provision being made for half of the air to be circulated through truckloads on one track and half through those on the other track. Subsequent design developments made this virtually a cross-circulation kiln in which the total air volume was directed up or down one wall to pass through both rows of lumber trucks with approximately double the air velocity with practically the same internal-fan system.

A number of short-shaft or cross-shaft internal-fan systems have been developed, many of which are still being used in modern improved forced-draft kilns. The following is a brief discussion of the principal basic types whose principles of operation are used in modern kiln installations:

One system was a variation of the longitudinal- or long-shaft system, in that individual cross-shafts mounting the fans placed at regular intervals in the ceiling, were connected to a single longitudinal shaft passing along the side of the kiln. In a system featuring a similar ceiling arrangement of short-shafts and fans, an individual motor was provided for each shaft. Another system had large fans placed at regular intervals in one wall of the kiln arranged to blow air directly through the lumber load across the kiln chamber. An internal-fan system in which the fans were located either above or below the load also used direct motor driven fans to provide air movement the length of the kiln. These fans were arranged to blow the air through unit heaters and upward or downward, according to fan location, against baffles which directed the air through the lumber load, traveling full length of the kiln, and then downward through

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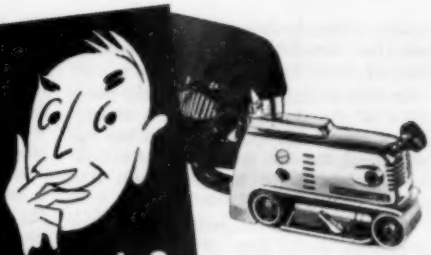

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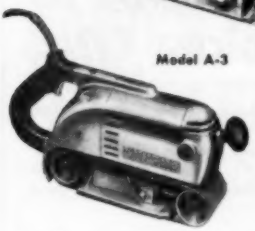

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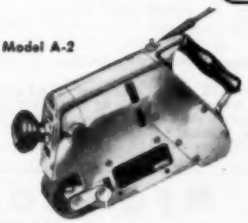

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return outlets back to the fans. Reversible fan circulation was provided in most of these systems.

An interesting cast history was provided of the development of a short-shaft internal fan system, which has its fans facing the side walls and individual drive provided for the fans with the motors placed inside the kiln.

The object of development study was to provide direct flow of air crosswise of the lumber without any end drift of air currents, which had produced end drift of heat and humidity, a fault encountered in some long-shaft internal-fan systems in which the fans were faced lengthwise of the kiln. Another objective was to minimize horse-power requirements with a direct ball bearing fan to eliminate friction experienced with plain bearings on the line shaft, as well as to reduce horsepower consumption taken by baffles and ducts as used in the long-shaft fan system.

In the development of the long-shaft kiln the fans were first placed in groups, with one half of the kiln equipped with right hand fans and other half with left hand fans. While this arrangement did minimize end drift, it was not wholly satisfactory. The fans were then placed in pairs, with two fans blowing into each other and the air coming off a backing board so that the volume of the two air flows came out directly crosswise. This arrangement had the effect of creating high velocity between the groupings and also consumed more air than when the fans were placed in groups.

On the basis of these experiments and studies it was finally decided by this development group that a direct cross-flow system, with direct fan installations placed to face the wide walls to direct free flow of air without duct or baffled deflections, would provide required air uniformity as well as the best air volume per unit of horse power. In this system both fans and motors

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were placed inside the kiln. Glass-wound moisture resistant motors were provided to withstand severe kiln conditions.

Various special internal-fan systems were observed which used standard commercial units but varied somewhat from the standard commercial kiln circulation systems in application or arrangement of fans.

Larger fans were used to produce high air velocity in a double track kiln. The system providing circulation had twelve 60" reversible fans mounted on individual gear motors turning over at slightly more than 300 r.p.m. These fans were located in the partition wall between the two units, and were arranged to first blow air through one load and suck it down through the other, reversing the procedure at regular intervals with reversed fan circulation. Careful placement and spacing of the fans was made to maintain low resistance and high efficiency.

This fan system was said to produce an air circulation of 400 to 500 f.pm. through the lumber load and uniform circulation was obtained with adequate spacing provided for above and below the loads, varying not over 50 f.p.m. Most resistance was apparently eliminated since no air ducts were used and pitot tube measurements showed no static resistance.

In a direct gas-fired kiln system axial flow fans were installed in a fan baffle suspended from the ceiling a short distance from the rear wall. The fans operated to blow drying air across the top of the lumber load to the forward end of the kiln where it was drawn back through the lumber to do the drying. It was claimed that the high velocity circulation produced by these axial flow fans eliminated any need for reverse cycling of the drying air.

A commercial hot air kiln of the trackless type, loaded and unloaded by

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fork lift truck, used a fan-operated hot air system with circulation traveling from overhead in a horizontal U-flow duct to return ducts in the floor. Air circulation was directed through the packaged lumber stacks by first separating the kiln space into separate circulating units by means of movable partitions, and next by the use of side and overhead baffles which swung and dropped to fit at the corners of the stacks.

Flaps were hinged to the side wall and swung in to fit at the corners of the first and last load on each side. A monorail-suspended metal partition then divided the kiln into two drying chambers, and each of the two lumber charges were completely boxed in two compartments. Air ducts between the ceiling and roof carried air separately to each of the two compartments, discharging at either end of the section, air flow being directed around and through the stacks, and returning by way of iron grating set in the floor at either end and on through return ducts underneath.

In a direct oil-fired kiln system a plenum chamber was provided along one side and fans were located at each end of the plenum and lumber compartment. A vent was provided near each fan. As hot air was blown from one fan into the lumber compartment, the second fan acted to draw moist air from the opposite end of the lumber charge and back into the plenum chamber, with some going out the vent. The fans were reversed every 12 hours. Air movement between the lumber courses was made at high air velocities under pressure of 48" fans turning at 1,150 r.p.m.

Blower-type circulation systems are usually arranged for recirculation and are not reversible. An exception to the

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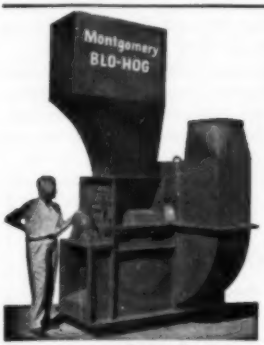
rule was found in a steam jet blower reverse circulation kiln which had its jets located on a steam supply line with an angle swing joint permitting the jets to be rotated axially through an arc of about 90 degrees. Changing the position of the jets to blow up the opposite sides of the pile reversed the circulation. Most kilns studied, however, were of the external-blower type using centrifugal blowers to produce circulation.

The external-blower circulation system usually operates to draw fresh air through an intake in a duct which leads to the blower, which is generally located in a chamber outside the kiln. From the blower the air is passed through heating and humidifying units and is forced into a duct extending into the kiln. Circulation proceeds in much the same manner as in natural-circulation kilns to outlet vents of return ducts along the sides and in the floor of the kiln. Provision is made to exhaust some of the moisture-laden air and the rest is returned to be mixed with fresh make-up air through the blower and conditioning units for recirculation.

In many blower-type systems the blower and conditioning chamber are located below the track-level but in some the blower is placed outside the kiln in an operating room at one end. Practically all are arranged to blow heated air into a supply duct which extends the full length of the kiln and is equipped with slots for air to enter at the top (floor level of the kiln) and air delivery into the lumber loads. Air movement regulation throughout the kiln is the function of air scoops projecting below the duct slots. Return air slots are also provided in the floor for air to move into the return air ducts.

Steam sprays generally are provided to furnish necessary humidity and ventilation is provided by roof ventilators or a ventilator stack in the blower



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housing. Fresh intake air is drawn in by the blower, usually through a special fresh air door in the blower housing. A double supply duct system is often provided for double track kilns, equipped with two rows of air ports located down the center of each track. Relief air slots are provided at the back end of each supply duct which are adjustable to regulate air pressure in the duct for uniform air delivery throughout the length of the kiln.

It is customary to provide inverted V-shaped flues in the lumber loads so that air can be blown up into the center of the load. Adjustment of the air scoops controls the volume and direction of air flow from the supply duct, opening or closing them for required regulation. Air entering the flue in the lumber load upward passes through the stack and outward to each side in the space between the load and kiln wall, from which point movement is downward into the return air ducts which carry it back to the blower for venting and reconditioning.

Departure is made from conventional blower-type systems, just as in other forced-circulation systems. A forced-draft kiln with blower-driven external furnace heat was operated by a blower, but circulating fans mounted overhead in the center of the kiln and vents and dampers furnished a greater part of control of air flow and circulation. The system was designed to return moist-warm air from the kiln to a jacket over the furnace, with vents exhausting some to the outside and dampers providing the required amount of cool, fresh intake air.

One of the more unusual developments which dispensed with the usual supply duct throughout the length of the kiln was the plate type reversing circulation kiln produced commercially during the 1930's. This kiln design provided air movement by building up pressure in a supply air chamber between the wall of the kiln and perforated plates. Air was conditioned for required temperature and humidity in an outside conditioning chamber before entering the supply air chamber, where pressure created by the blower-fan distributed the conditioned air over the entire surface of the plates and forced it out through the perforations through the lumber load.

The moisture laden air was then drawn through an opposite set of perforated plates and returned to the conditioning chamber, where part of the

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air was exhausted outside and the balance was mixed with fresh replacement air for reconditioning and recirculation. Automatic reversing mechanism was also provided to automatically change the air flow periodically to provide uniform drying conditions through both sides of the lumber load, applying higher inlet temperature first to one side and then to the other. The fan was connected to both supply and return chambers, so that the amount of air put into the kiln was arbitrarily brought back to the blower, where the required amount of moisture laden air was exhausted. Although the concern which originally manufactured this kiln has gone out of business, many of the original kilns are still in operation. A modern version of this circulation system is said to be currently available from another source using similar equipment.

A modern development of the blower-type kiln circulation system has been the provision by commercial dry kiln concerns of packaged air conditioning units in the form of standardized completely assembled unit, with the possible exception of fragile instruments, so that essentially only connections to steam, water and electric or pneumatic supply sources are required. A single concern may standardize as many as eight sizes of these units to meet requirements of individual kiln installations for lumber drying.

The foregoing have been selected as typical circulation system developments and include many of the important basic types although it is very possible that all ramifications have not been touched upon and all current kiln circulation systems have not been discussed. Piling methods have also been developed for better control of circulation through the lumber load. Brief mention was made of piling for natural-circulation dry kilns and others will be discussed in a later article.

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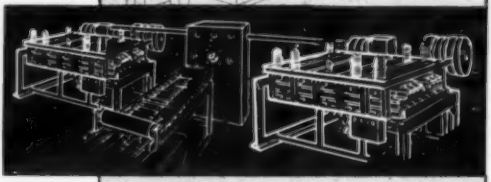

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By Howard K. Haskell

ELECTRONIC end-joint gluing has proved a many-sided advantage for Canadian Wood Pipe & Tanks, Ltd., Vancouver, B.C., a leading fabricator of wood stave pipe, tanks, towers and related items. Working with engineers from Mann-Russell Electronics of Tacoma, Washington, the Canadian firm started using electronic equipment in the fall of 1950, primarily to increase the average length of wood staves through the end-joint gluing of blanks.

The original objective has been attained, according to R. H. Culter, manager of Canadian Wood Pipe & Tanks —and, in addition, a number of other advantages have been found:

1. The average length of pipe has been increased higher than ever before in the history of the industry.

2. Canadian Wood Pipe & Tanks is now able to furnish wood pipe to customers in specific lengths as required.

3. The long average length pipe has cut production costs through a decrease in the number of couplings required, reduced handling, and increased production per man hour.

4. The electronic gluing makes possible the use of heart lumber in shop grades, much easier to obtain than heart lumber in clear grades.

The last factor—difficulty of obtaining clear lumber in the long lengths required—was one important reason for turning to electronic gluing. Natural trends in the lumber industry, speeded by the war and the demands of the plywood industry, made clear logs scarce and high in price. Using short length lumber and older fabricating methods meant less production and higher unit costs.

Today, these more readily available short lengths are electronically end-joint glued into a continuous piece which is then cut to the lengths required for pipe manufacture. Most of the lumber used is shop grade which goes to the splicing plant untrimmed, as kiln dried shop.

A crew of four men handle the operation. Lumber is trimmed for defects, the finger joint is cut and glue applied. Stock then feeds into a Mann-Russell continuous end-joint press and emerges as a continuous strip. Moving onto the off-bearing table—which itself moves forward after striking an adjustable "stop"—the glued-up stock is cut to predetermined length by a swing cutoff saw. From the time the lumber is trimmed until it is cut for lengths as blanks, it moves on belts to eliminate every possible handling step.

At present, end-joint gluing is done at a speed of 30 lineal feet per minute. However, a new and improved Mann-Russell electrode system is soon to replace existing electrodes, at which time the footage will be increased by 30% or more. The new electrodes will also add to the versatility of the press in respect to stock widths and thicknesses.

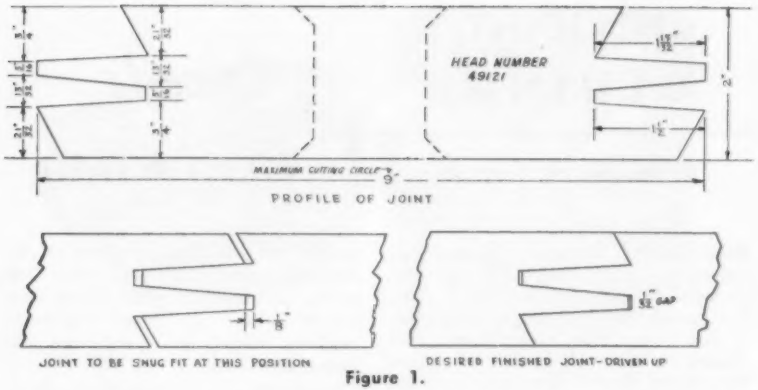
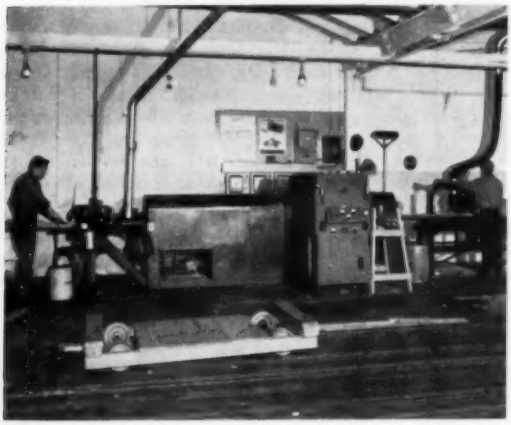

HEAD NUMBER
49121
MAXIMUM CUTTING CIRCLE 9"
PROFILE OF JOINT
JOINT TO BE SNUG FIT AT THIS POSITION
DESIRED FINISHED JOINT - DRIVEN UP

Figure 1.

Design of the finger joint is of major importance. The joint made by the first cutterhead employed was too steep, and accounted for some early difficulties. A new Jones & Orth cutterhead, put into service after a few months of operation, provided a finger joint of the type shown in Fig. 1. Here the two outside surfaces are twice as long as in the old joint, have a slope of grain of 1 in 16 on the outside surfaces, a slope of 1 in 12 on the center surface. The whole joint uses 1½" of wood instead of the 1¼" in the earlier joint.

Other features of the installation include an especially designed jointer built by Letson & Burpee, Ltd., Vancouver, B.C. Mann-Russell, custom manufacturers of electronic gluing equipment, supplied the press and the high frequency generator—a Mann-Russell Model 400, having a measured output of 10 kw. The press itself was engineered



Over-all view of Mann-Russell electronic generator and press installed at Canadian Wood Pipe & Tanks, Ltd., Vancouver, B.C. Operator at left, standing beside glue applicator, feeds stock into press. Operator at right operates the swing cutoff saw which cuts blanks to proper lengths.

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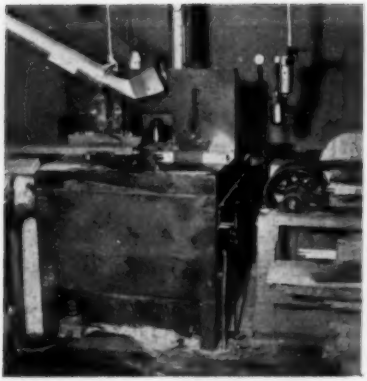


Blank on off-bearing table is emerging from electronic press. Note how short stock has been used to make possible the fullest and most economical utilization of material.

and built by Mann-Russell for this particular operation.

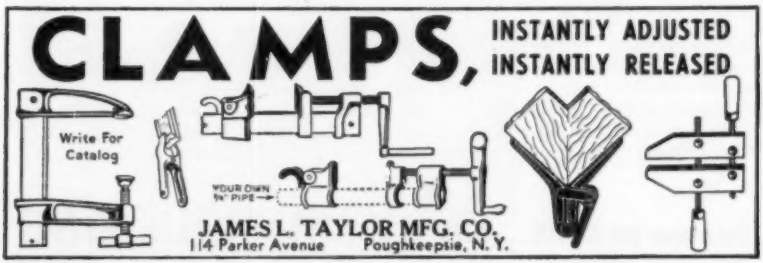
Use of the finger type joint has been employed for years to a limited extent. Today it is gaining increased acceptance because of proved exceptional joint strength—upwards of 80% of clear wood, when properly engineered for the specific application involved.

A finger joint designed for 1" or 2" stock, for such items as paneling, shelving, casket material, studs and similar uses, will not necessarily be suitable for the type of application described here. Individual problems, however, can be met through proper engineering of the joint itself and the equipment used.

Fast and effective means of curing glue electronically are now well established. The technique can, and should, be used more extensively—particularly as a result of the considerable research and development of finger joints done by D. B. Richards, forester, and B. M. Cool, assistant forester, Alabama Polytechnic Institute, Auburn, Alabama.

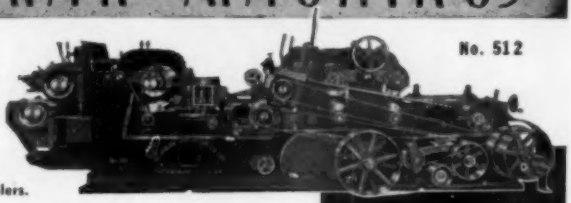
Close-up of the Letson & Burpee jointer with Jones & Orth cutterhead, especially engineered to provide a finger joint suitable for milled pipe staves.

The use of electronic gluing to increase utilization of wood resources is, in fact, on the increase. Other firms using applications similar to the one discussed here include: Pacific Lumber Company of Scotia, California, and Hammond Lumber Company, Samoa, California.



NEWMAN MACHINES

Newman



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Single and double profilers.

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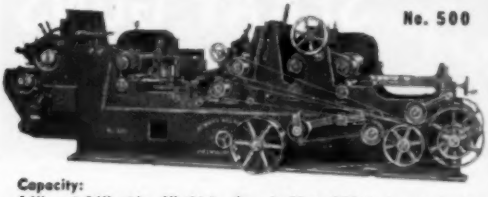

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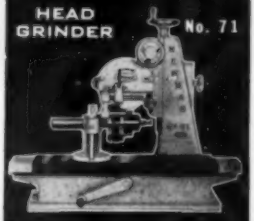

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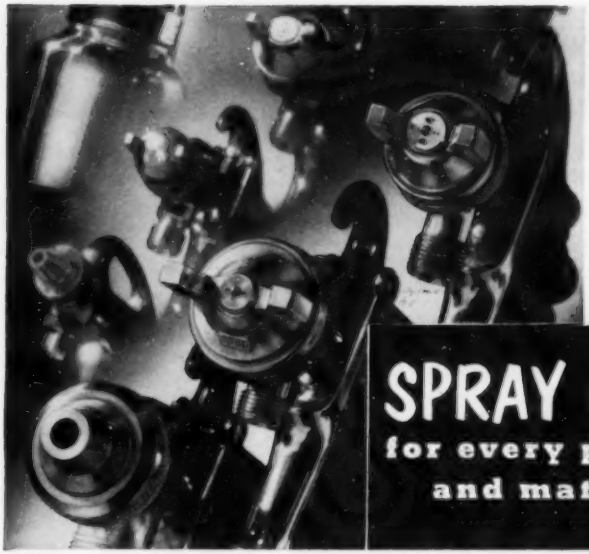

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FORCE DRYING Wood Finishes

By K. R. Brown

Mr. Brown is director of the Varnish-Resin Laboratory, Sherwin-Williams Company, Chicago, Ill.

SINCE one of the purposes of finishing wood is to enhance its beauty, stain is used to obtain a decorative and marketable color, and to accentuate the grain pattern. The porosity of the wood determines whether or not it is to be filled. Very porous woods such as mahogany, walnut and oak require a highly-pigmented, heavy-bodied filling material. On the other hand, semi-porous woods such as maple, birch, gum, etc., or nonporous woods such as pine and fir require less or no filling. The least porous woods are then usually stained by a highly colored pigmented stain which is wiped into the small pores. As its application would indicate, it is called a wiping stain and serves to both stain and fill the small pores of wood. With the very porous woods, the stain is usually applied separately and prior to filling. These stains are usually dyes dissolved in water—the water stains, or in solvent— the non-grain raising stains. The filler, like the wiping stain, is wiped or padded into the pores.

As we all well know, wood is composed of fibrils. These will tend to stand on end as a result of the wiping action employed in the application of stain and filler. In order to eliminate these, a sanding sealer is applied. This sealer embrittles the fibers so that when sanded they are cut off, thus leaving a smooth foundation for the finishing coats. The finishing coats are applied according to the requirements of the finisher in sufficient thickness to provide the desired depth of appearance, satisfactory protection and a film that can be subsequently rubbed and buffed where desired.

The property of wood that becomes the greatest single factor to be considered in force drying finishes applied thereto is that of hygroscopicity. The hollow cell structure of wood allows it to absorb and release moisture rather readily. Any sudden change of mois-

Table 1.—Mode of Drying Process of 13 Finishing Materials

	Evaporation	Oxidation	Polymerization
Water stains	X	....	....
Non-grain raising stains	X	....	....
Shading stains	X	....	....
Fillers	X	X	X
Toners	X	X	X
Primers	X	X	X
Lacquer Sealers	X	....	....
Varnish Sealers	X	X	X
Lacquer Top coats	X	....	....
Varnish Topcoats	X	X	X
Heat Converting Varnishes	X	....	X
Enamels (Varnish)	X	X	X
Enamels (Heat Converting)	X	....	X

ture content usually has dire results on the wood or on structures made thereof. For this reason the relative humidity in ovens must be at a level to prevent sudden and severe loss of moisture from the wood. The high relative humidities thus required are in conflict with those factors contributing to the best drying of finishes. This property of wood not only requires humidity control, but limits the temperatures at which force drying of wood can be carried out. Practical experience has shown that temperatures above 150°F. cause moisture change at a rate so rapid that checking of veneer, cracking of wood, delamination of plywood and loosening of glue joints can occur.

Drying Processes of Finishes

There are several types of finishing materials required to properly surface, decorate and protect wood. These types embody all of the three major processes that finishing materials undergo in drying.

1. Evaporation of Solvent: All of the conventional finishing materials are thinned to working consistency by suitable solvents. In order for a material to arrive at the dry state, this solvent must be removed from the film. In some cases, such as with lacquers or dye-type stains, this is the only process involved in drying. In other types of materials such as wiping stains, fillers and varnishes, solvent evaporation is the first stage of drying and must be followed by one or both of the other processes.

2. Oxidation: Many of the finishing materials in use today contain vegetable or animal fatty oils as the film-forming or "flexibilizing" ingredient. These substances dry by oxidation. That is, in their original state they are liquid or semi-solid in nature. In such state, satisfactory continuous films are not formed. They are converted to solid continuous films by reaction with oxygen from the air. Oleo-resinous and alkyd type varnishes must utilize this drying process since they include oils in combination with resinous materials. Fillers, being essentially pigmented oils, also require the oxydizing process.

3. Polymerization: This terms refers to the chemical reactions which tie together many molecular groupings to form long chains of the chemical building blocks. In the "mono" form a chemical is liquid or soft compared to the "poly" form. In other words, as the molecular weight (or the number of molecular groupings tied together) increases, the harder, more insoluble, more chemically resistant a compound becomes. This process takes place only after the molecules are sufficiently activated. They can be thermally excited by heating or they can be chemically turbulated by catalysts. Obviously, and such is the case with wood finishes of the strictly polymerizing type, molecular agitation can be accomplished by a combination of both means. The heat-converting varnishes are of this type. Polymerization is also involved with oxidizing type materials since oxygen serves to cross link oil molecules.

Table 1 will show how most of the

Table 2.—Equivalent Baking Schedules for Conventional Thermal Setting Varnishes

Schedule A[1]	Schedule B[2]	Schedule C[3]
1½ hours at 140°F.	1 hour at 140°F.	¾ hours at 140°F.
2¼ hours at 130°F.	1½ hours at 130°F.	1 hours at 130°F.
3 hours at 120°F.	2 hours at 120°F.	1½ hours at 120°F.
16 hours at 100°F.	16 hours at 100°F.	16 hours at 100°F.

[1]For finishes to be rubbed, buffed or packed one hour after removal from oven.
[2]For finishes to be rubbed or buffed 18 to 24 hours after removal from oven.
[3]For finishes to be packed unrubbed 18 to 24 hours after removal from oven.

wood finishing materials employ combinations of these three drying processes.

Requirements of Force Drying Equipment

In light of what was discussed above relative to the various physical and chemical forces that are involved in the drying of wood finishing materials, it can be seen that there are three fundamental requirements of force drying equipment—(1) evaporation of solvent, (2) provision of oxygen, (3) thermal molecular excitation. Because the substrata (wood) is hygroscopic and subject to efforts of moisture change, a fourth requirement is expected of this equipment—to provide controlled humidity.

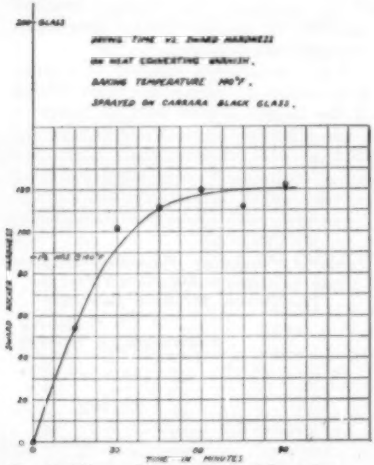

Fig. 1 Effect of time of varnish curing.

Evaporation of Solvent

From Table 1 it can be seen that all of the conventional finishing materials must lose their solvent as the first step

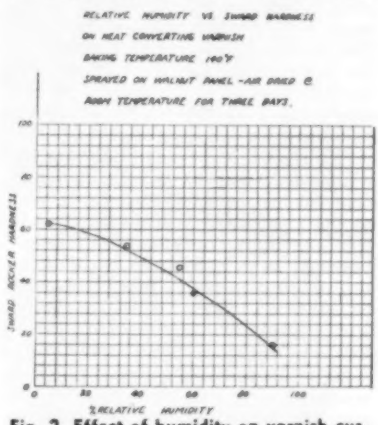
RELATIVE HUMIDITY VS. KNOOP HARDNESS
ON HEAT CONVERTING VARNISH
BAKING TEMPERATURE 140°F
SPRAYED ON WALNUT PANEL - AIR DRIED @
ROOM TEMPERATURE FOR THREE DAYS.
KNOOP ROCKER HARDNESS
% RELATIVE HUMIDITY

Fig. 2. Effect of humidity on varnish curing.

in drying. This is accomplished by the heat provided in the oven and by air movement. The heat provides the kinetic energy necessary to drive the solvent from the film. The air movement carries the vapor away from the area immediately adjacent to the film surface so that the evaporation process can continue at a satisfactory rate. If the vapor was not carried away some of the molecules could condense and again become entangled in the film. This would lower the net effective evaporation rate.

Another consideration to be made in regard to the effect of heat is that as

Table 3.—Relative Humidity-Temperature Relations to Maintain 7 Percent Equilibrium Moisture Content

°F. Dry-bulb	°F. Wet-bu b depression	Relative humidity percent
100	21	39
110	22	41
120	23	42
130	24	45
140	25	47
150	25	49

soon as some solvent evaporation takes place a cooling effect results which tends to lower the temperature level. This means that a certain thermal input is necessary just to maintain the dynamic balance of the system. To increase the evaporation rate the temperature must be increased accordingly.

From a practical point of view, it would seem that the quicker the solvent can be driven off the faster will be the total finishing schedule. This is true, but there are limiting factors introduced by performance characteristics of the material. Time often must be sacrificed to obtain proper performance. Solvent must be lost at a rate that will reconcile these factors.

Sufficient time must be allowed, for instance, for the material to flow out properly before too much solvent is lost. If this time is not allowed the film will show "orange peel."

Too rapid initial evaporation, whether from too much heat or air movement, might cause excessive solvent loss from the surface of the film, resulting in "casehardening." Then as the solvent beneath the surface tries to escape through the hardened surface it would blow the surface into small bubbles or blisters.

Also, if dynamic balance is not maintained between heat input and rate of evaporation, excessive evaporation of solvent from air flow might reduce the temperature sufficiently to condense moisture on the wet finish surface. Water would "kick out" the solids from colloidal solution causing bloom, or blushing evidenced by areas of dullness and whitening of the film. In most cases subsequent heating is not sufficient to remove this defect.

Therefore, the proper rate of evaporation is determined by the performance of the particular material being dried. This is sometimes done by a suitable gradual increase of temperature or air movement in the oven. As a matter of fact, in the majority of cases a "flash off" time at room temperature is necessary before introducing into the force drying equipment.

Provision of Oxygen

The provision of oxygen, of course, is done by the introduction into and movement of air through the drying oven. From the chemical point of view, there is no maximum limit on oxygen provision. The film will take up the amount it requires and no more. There is a definite limit on the minimum side. A little stoichiometry will determine this for any given finish. The amount of air necessary for physical reasons, however, is usually several times that required chemically.

If an insufficient amount of oxygen is provided, it means improper drying of the finish. In the case of fillers or wiping stains, improper drying could lead to poor wiping, open pores and filler blushing. With varnish sealers or primers, poor sanding would be encountered and consequent unsatisfac-

Table 4.—Relative Humidity-Temperature Relations to Maintain 5 Percent Equilibrium Moisture Content

°F. Dry-bulb	°F. Wet-bulb depression	Relative humidity percent
100	28	24
110	29	27
120	32	28
130	34	29
140	34	32
150	36	33

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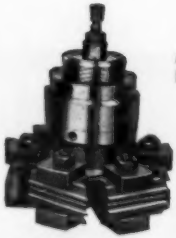
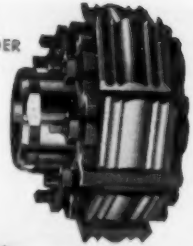
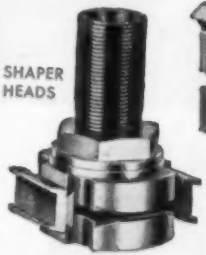


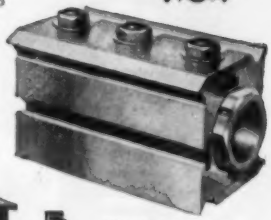
MATCHER HEADS

MOULDER HEADS



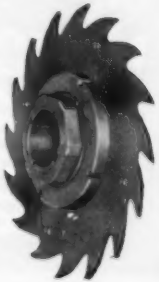
SHAPER HEADS





SQUARE HEADS

SOLID CUTTERS



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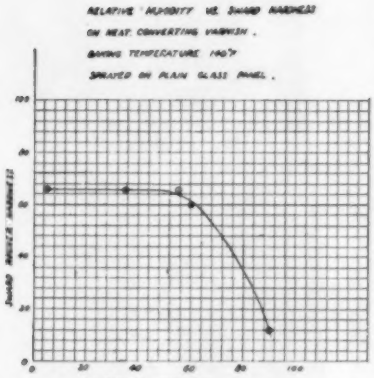

Fig. 3. Force-drying schedule study.

tory surfacing and adhesion could result. Improperly dried topcoats would show poor print resistance, unsatisfactory water and chemical resistance, softening back during rubbing and buffing; and many and varied surface defects.

Thermal Molecular Excitation

The polymerizing reactions involved in the curing of thermal setting and drying of other types of varnishes are dependent on the increased movement of molecules. Simply by the law of probability separate molecules will contact each other more often in a given time if the frequency of their vibration and orbit of activity are increased. Heat is the most common method of exciting molecules. The heat-converting resinous materials are so formulated that on molecular excitation the smaller chemical units unite to form larger molecular units that make up the film forming polymers. The only factor to be considered here is that the force-drying equipment provides the temperature and time schedules that the formulator has found is necessary for the particular coating involved. Figure 1 shows a typical time and temperature study of a conventional thermal-setting coating. Temperature ladders are run to determine such curves at several temperature levels. The point at which the proper hardness is obtained determines the recommended temperature-time schedule. The proper hardness rating is that point at which satisfactory chemical resistance is attained as well as the actual hardness necessary for proper rubbing and packing performance.

Table 2 shows typical equivalent temperature-time schedule comparisons as developed from the type of data described above.

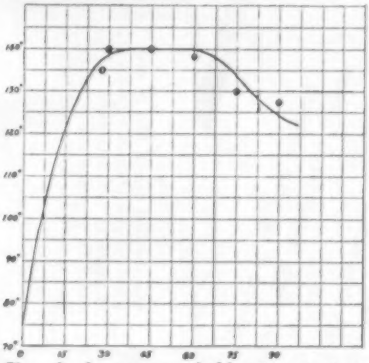

Fig. 4. Improper baking-temperature curve.

Needless to say, insufficient heat would result in undercuring and the same general film failures that improper drying of oxidizing finishes would exhibit.

Humidity Control

The need for proper humidity provision to maintain the optimum moisture content in the wood has been pointed out above. It is believed most finishers prefer to maintain wood moisture contents at 5 to 7 percent. Table 3 shows the relative humidity values necessary at various temperature levels to maintain a 7 percent moisture con-

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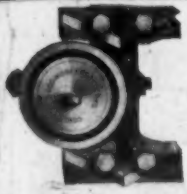

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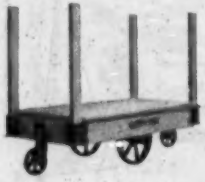

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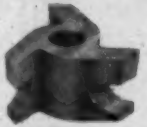

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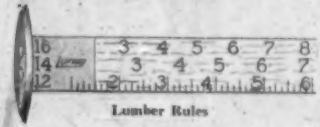

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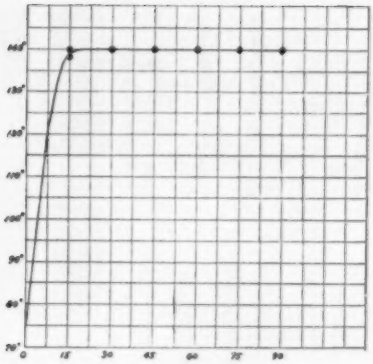

Fig. 5. Ideal baking-temperature curve.

tent. Table 4 gives the data at 5 percent.

Above it was also stated that in general any humidity is a deterrent to finish drying. This is true since moisture vapor in the atmosphere retards evaporation of solvent. There is no real agreement as to the correct theory on this phenomena. Excessive humidity is also a source of trouble due to its possible condensation into the film causing poor drying, blushing, blooming, frosting, or low gloss.

In the polymerization process, certain volatile vapors, not solvents, are released by the chemical reaction. High humidity retards the release of these vapors. Figures 2 and 3 show the effect of humidity on curing converting varnish. Figure 2 shows the curve resulting from plotting hardness against humidity at a fixed schedule of 140°F. for 1½ hours on walnut panels at 7 percent moisture content.

Figure 3 is the same except that glass panels were used in order to obtain direct hardness reading free from surface variations in the substrata.

Hardness was determined by the Sward Hardness Rocker, an instrument that works on the principal that soft surfaces will provide more resistance than harder ones to swinging of the chrome-plated brass swings. The values are simply the number of swings made through an arc of 20° as measured by tube style levels.

The tables show that as humidity is increased, the film hardness decreases. At about 60 percent the hardness drops off sharply indicating practically no cure at higher humidity levels.

Desirable Equipment Design Characteristics

There will be no attempt made here to discuss in detail oven and conveyor design. This should be left to those people who are informed in that field. In view of the demands made on such equipment by the fundamental chemical and physical properties of finishing materials, it would be well to discuss the very basic desirable design features from the finish producers' point of view. These are discussed under the three functions of force drying equipment: (1) temperature and time schedule, (2) air movement, and (3) humidity control.

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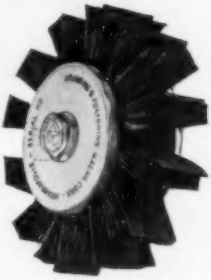

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Temperature-Time Schedule

The major concern under this function is that the temperature cycle be satisfactory. In general the temperature should rise gradually, reach the specified level and hold at that value for the proper time. In some cases ovens are designed on the basis of finishing material formulations, but in the majority of the cases the opposite is true. Regardless of which is the case, the proper temperature cycle must be provided. Figure 4 shows the type of temperature cycle that is often encountered. Obviously this does not give the optimum temperature throughout the entire length of the cycle. Figure 5 shows the desirable curve. The sliding temperature curve of Figure 4 is often encountered in batch-type kilns where the heat is turned on full late in the afternoon, then turned off at quitting time and allowed to drift during the night. The same type of thing is encountered in conveyor ovens, probably because of improper design or inconsistent control.

Also of importance to proper drying of the finish is the distribution of heat. There should be no areas in the oven where heat is not carried. Many times the bottom of the tunnel is not sufficiently heated. How the heat is introduced is a problem for the oven engineers but in their designs they should take into consideration the type, size, and shape of pieces being finished. This may make some differences in the manner that heat distribution is provided. It is also important that the kiln and conveyor designers recognize the type of coating materials to be used and are familiar with their properties. Complete knowledge of these facts will aid greatly in providing the correct flash-off time, upheat rates and temperature and conveyor speeds (or batch kiln capacities).

In conveyor systems the time factor is controlled by the speed of movement through the oven. The conveyor engi-

neers are therefore to be consulted as an integral part of the team that must cooperate in this endeavor.

Air Movement

Direction of Flow: The flow of air through a conveyorized oven or tunnel type kiln should preferably be counter to the direction of movement of the finished pieces. In this way air relatively free from vapor sweeps across the dried film first and carries vapor it picks up in its travel through the oven toward the front end where vapor concentration is necessarily high. If the air movement is in the direction of flow of pieces, it would carry vapor-laden air over the dried film, thus tending to reduce maximum drying efficiency or resoftening of the finish.

Distribution of Air: The mere movement of air is not the only consideration to be made. As pointed out above, the heat should be evenly distributed, so the air movement should be such that there is hot air moving throughout the entire cross section of the oven.

Amount of Air Flow: The amount of air introduced into the oven is limited on the maximum side by economy and on minimum by the lower explosive limit. The National Board of Fire Underwriters require not less than 10,000 cubic feet of fresh air per gallon of solvent to be evaporated.

Ratio of Fresh Air: Another consideration of the air flow problem is the ratio of recirculated air to fresh air. A generally accepted ratio is three parts of recirculated air to one of fresh. No formula exists to logically determine this ratio. Consultation between finish supplier, finisher and equipment manufacturer would be in order on this point.

Humidity

The limiting factor of humidity has already been discussed. The main things to be kept in mind are: (1) that proper

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engineering has been applied to provide proper moisture contents and method to accurately control that content, and (2) that good maintenance is provided to insure consistent humidity control.

A factor of equal importance to that of engineering to obtain satisfactory levels and distribution of heat, air and humidity is the provision of high-quality instrumentation. Recording thermometers, manometers and hygrometers properly placed are highly desirable. The cost of installation and maintenance of such equipment will surely pay for itself in reduced finishing troubles. The assurance of properly operating equipment adds to the efficiency of plant operation and finishing quality control.

Further Consideration

There are many questions that cogitating on this subject should bring forth. There is need for serious study on certain phases of the general problem.

Someone, for example, should develop a physical law to explain the phenomena involved in the retarded evaporation of solvents by high humidities.

All the factors should be considered to arrive at some kind of rule regarding the length of flash-off time necessary for particular finishes.

A formula should be developed to determine the amount of fresh air necessary to dry a finish and its correct ratio to recirculated air .

This article is part of a paper presented at the Forest Products Research Society. This material was of sufficient interest at the May meeting of the F.P.R.S. that we are reprinting some of it with perm'ssion.

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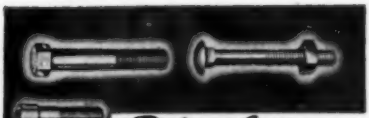

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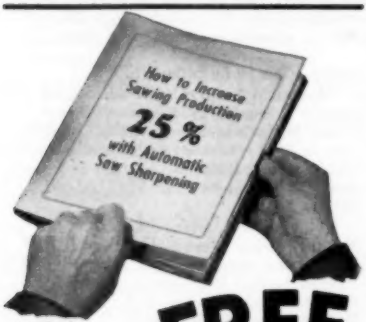

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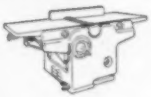

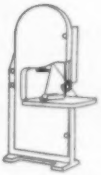

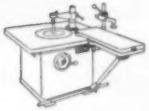

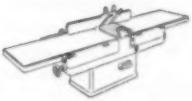

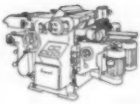

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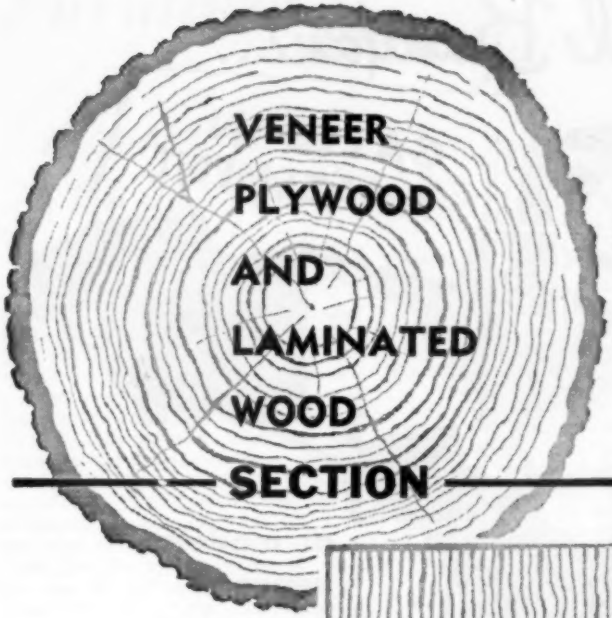

Features . . . .

Furniture Manufacture
By H. H. Connelly

Auditing Quality
By James S. Bethel

Paul Bunyan...

at modern veneer processing equipment

● At the hardwood exhibit in Chicago's Museum of Science and Industry, Paul Bunyan, the mythical giant lumberman, joins the 2,000,000 persons who have already gazed in amazement at the complete and interesting display depicting the growth and scope of the hardwood industry.

Prominent among the many intriguing and amazing displays are working models showing both lumber and plywood being produced, which include models of Coe veneer machines. This is indeed apropos in view of the important part played by Coe since 1852 in this vast and ever growing industry.

This exhibit which represents an investment of $400,000 is serving to annually acquaint millions of persons with the beauty and utility of hardwoods in many and different applications. Of great educational value to the public at large, it is a "must" for anyone in the woodworking industry when in Chicago.

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Furniture Manufacturing

A CRAFT WITH TRADITION

Part 3

By H. H. Connelly

ONE of the interesting processes used in the Colonial Period in making furniture was that of laminating fancy face veneer to solid lumber cores to enrich a chest front or top. Animal glue was the only adhesive available, consequently it was necessary to work the part warm to keep the glue from chilling before wood to wood contact was accomplished. The knee-buckled chaps developed an amazing technique. The glue was first spread on the warmed wood then the veneer placed in position, and by rolling and kneading the veneer from the center to the edges the excess glue was squeezed out. As this process continued the glue solidified and the veneer was permanently fixed to the solid wood beneath. The only hazard was excessive humidity—one of the reasons we find few genuine originals of Sheraton, Chippendale and other masters of their time.

How would Thomas Sheraton react if he could walk into a modern furniture plant today? For one he would immediately note that the process of building furniture with veneered panels instead of solid has been one of the major solutions to the problems of gaining strength in addition to beauty.

And this has been made possible only as new processes were developed, new machines invented and water resistant, waterproof and boilproof glues formulated. Still more amazing is the fact that more of these advances have been made during your life span than during the two centuries before.

For we have seen the hot plate press develop and high frequency radio waves put to use to dry glue lines in both laminating veneer and assembling of furniture. We have witnessed the growth of tungsten carbide for wood cutting tools and promoted the research that led to the development of chip cores for panels.

Twenty years ago the manufacturers of sanding machines fainted when it was suggested they make a machine that would carry an abrasive belt 5,000 f.p.m. Now belts travel 7,000—10,000 f.p.m., producing a superb job of sanding.

We can classify the manufacturing of veneered furniture construction into two groups: (1) furniture panels built up with all plies of veneer—cross bands, straights, tops and bottoms and (2) furniture panels built up with a lumber core, veneer cross bands, tops, and bottoms.

Few pieces of furniture are found constructed of one type only. Rather the two types of panels are combined to gain maximum economy, strength and utility. By this practice it is possible to reduce the weight without sacrificing

Furniture panels made with a lumber core have a cost advantage in that defective material, unsuitable for solid furniture, can be veneered with expensive veneer. Here a workman is making a round plug repair.

strength. A favorite spot for the all plywood panels is found in backs and sides of chests, drawer sides, drawer bottoms, trays and dust panels.

Veneered lumber cores, having a great advantage where thickness is important, are found in chest tops, table tops, bed boards, etc.

The standard lumber core panel is most frequently built up by the use of two 1/20" cross veneers and two 1/28" top and bottom veneers. The top veneer, usually the only veneer that shows, is of the same species of wood as the exposed solid parts, walnut, mahogany, cherry, etc.

The variable of panel thickness is controlled by the core thickness and is determined when planing the cores for pressing. Thus by varying the thickness of the core a few thousandths of an inch it is possible to produce several furniture panels with different finished thicknesses with the same veneers.

It should be pointed out that a balanced construction is essential for quality furniture panels and is just as important with lumber cores as with all veneered panels.

As in plywood, an odd number of plies is necessary to produce a balanced construction—three, five, seven constitutes the majority of plies used in building up a balanced panel.

Thick all veneer panels are costly and seldom used except where their construction is necessary to solve a strength problem.

Cores For Veneering Must Be Sound

The manufacturing of furniture panels, admittedly similar to the process of making plywood, presents problems that do not exist in standard plywood manufacturing from multiple sheets of veneer.

"You can put anything in a furniture core—except the kitchen sink." This statement was made by the owner of a small milling concern that had installed a ferris wheel clamp and rip saw to utilize the offal and short cuts that developed in the manufacturing of dimension stock to make furniture cores. "Not if you want to stay in business." This reply came from a man of wide experience in the problems of furniture manufacturing and who was aware of the misconception held by many that veneer would cover up all the sins of the woodworking industry.

It is quite true you can put unsightly defects in a core that would be impossible if left exposed. Likewise, you can make sound patches on furniture cores that would be prohibitive for solid wood construction.

The cross banding and top veneer cover up defects and strengthen weak wood. However, major defects such as knot holes, large splits, bark and rot can often be detected when the surface has obtained a high polish in the finishing room.

The wood for panel cores is important, too. Likewise, the manner of ripping

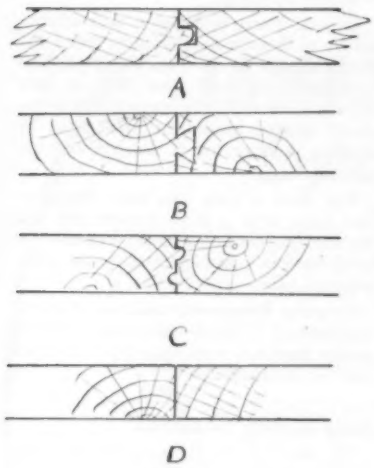

Figure 1.

and gluing affect the final product. The moisture content of the wood is also a critical factor to consider.

When the problem of producing plywood lumber cores is reduced to its simplest analysis two questions stand out uppermost in the minds of the concern involved. First in importance is the type of joint to place on the random width pieces for gluing into a substantially sound core. What is the best type of joint? A square, tongue and groove or dovetail? How is the joint best applied, and how economical can it be made?

The second question that faces the concern manufacturing furniture lumber cores is the question of best method for gluing the random width pieces together to make a wide core.

Shall I use clamps, steam heated panel gluing machine; or would high frequency be the best answer?

Let's take the first question. After the lumber has been reduced to stock length through the swing saw, it reaches the rip saws for further reduction in a rough planed stage. Most defects near the ends have been removed at the swing saws.

This leaves one primary job for the rip saw: to remove the objectionable defects from the center of the board and prepare it for gluing.

The straight line rip saw operator has one major responsibility. To remove the defects with the least amount of waste.

Butt Glue Joints Are Best

For the manufacture of furniture lumber cores, the best joint is that which can be produced with the least waste of material.

Illustrated in Figure 1 are four types of joints common to the wood worker.

(A) This type of joint is commonly referred to as a tongue and groove joint. To produce this type of joint the stock must first be ripped on the straight line rip saw, remove all the defects then apply the tongue to one side of a board and the groove to the other. A jointer is most commonly employed for this operation. One side of the jointer is equipped with a grooving head and the other side a head to produce a tongue.

Care must be taken to cut the groove slightly deeper than the tongue or an open surface joint will result. Likewise, much good material must be left to provide sufficient material for the tongue.

(B) This is called a Linderman joint. The dovetail is tapered in such a manner as to draw the joints tightly together. Over 10% of the lumber is wasted to provide the tongue.

Straight line ripping is still necessary, but the gluing is performed on the Linderman machine at the time of cutting the dovetail and groove. At its

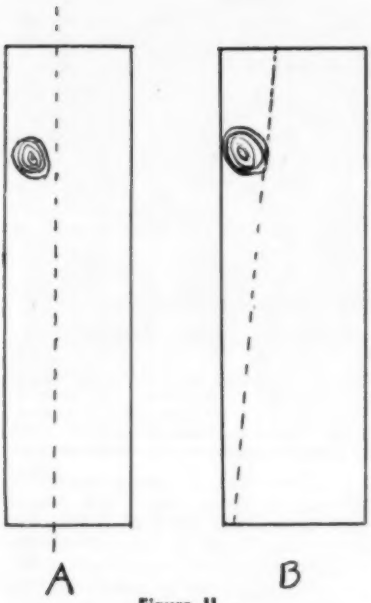

Figure II.

best, this machine is of little interest to the core maker. Besides being expensive, it requires more attention than a balky mule.

(C) This is a variation of the regular tongue and groove joint. Its chief advantage is found in the additional surface that it provides for gluing contact. The entire surface should be accurately cut or we lose its chief advantage. Here, as in all joints of this type, a waste of material and labor results.

(D) A square butt joint which can be made in two ways. (1) Rip to a straight line then joint on a conventional lumber jointer. (2) Rip to a straight line and joint at the same time with a glue joint rip saw. This makes a highly satisfactory joint and meets all the requirements of sound economical furniture construction.

Several years ago a test was undertaken to determine just how good the joints should be on lumber cores. The conclusion reached was that a core should have sufficient strength to withstand all the abuses of machining by planing, hammering if banded and repairing.

For once a core has been faced on two sides with a cross veneer, top and bottom, the strength is far superior to solid lumber glued with the most complicated joint.

In some European countries it is not uncommon to hold the random width pieces together with wire until the core has been laminated.

Good Ripping Techniques

We are concerned primarily with the saving of material at the ripping operation. Therefore, to be most efficient, the operator must know the various types of defects that can be permitted and those not permitted. In plants where the operators are chosen carefully and remain for long periods of time, the value of the lumber saved far offsets the premium wages paid for this important job.

There are two ways of ripping stock for gluing: (1) parallel ripping and (2) wedge ripping. In the first method a ripping gauge must be attached to the saw table. The operator removes a defect in the middle of the board, then parallel rips the outer edges.

In the second method the defect is removed and the good section proceeds into the next operation without recrossing the saw table.

For making furniture lumber cores the second method is far superior to the first, from the production standpoint as well as the waste viewpoint.

A glance at the sketch in Figure II illustrates the saving that can be realized by the wedge ripping technique.

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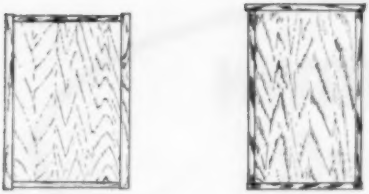


Figure III.

In (A) we have a board with a defective knot one-third the total board width which must be removed.

If removed by the parallel ripping method, 33 1/3% of the board is wasted. On the other hand, if ripped by the second method, (B), the waste is only 25%. This is a total saving of 8 1/3% in material with additional saving in labor.

By the way, how high is your waste?

If you are manufacturing cores, and your waste is too high to live with, here are several points that, if carefully checked, will yield rich results.

The first step to check is the quality of material going into the core. Maybe you shouldn't cut that knot out. This, to some extent, will be governed by the use to which the part is intended. Obviously, a core, that is to be made into a plywood panel and later cut into odd shapes, must be planned with sound wood throughout, to prevent the exposure of a defective body.

On the other hand, a core intended for a table top will take a sound defect. The only restriction being that the defect must be firm enough to provide a smooth, even foundation for the face veneer. Some have said, the multiplicity of sins a veneer will hide would fill a hollow log.

When defects do occur in your cores, don't cut them up. Try repairing. A small amount of labor will save many good feet of lumber. However, to repair a core it is quite easy to drift into the habit of using more labor than the entire piece of wood is worth.

New Material For Furniture Cores

In the last few years; as a result of the far reaching developments in synthetic resins, we have witnessed, an entirely new product for veneered furniture—chip cores.

The subject of chip core is a broad field and only mentioned briefly here to point to its bright possibility as a newcomer in the field of furniture manufacturing.

Coming at a time when competition is growing, conservation of natural resources a watchword, it merits extensive research for further utilization in the production of furniture.

In the past, one criticism has been the lack of screw-holding power. Another was chip core's lack of water resistant qualities. Chips telegraphing through the finished surface, made a piece of furniture look like a case of rash on the verge of breaking out.

New developments in glue, combined with resarch in pressing technique has

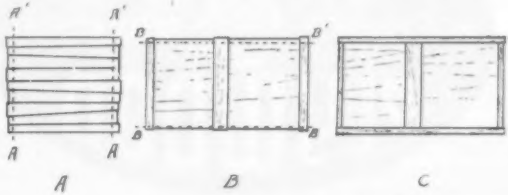
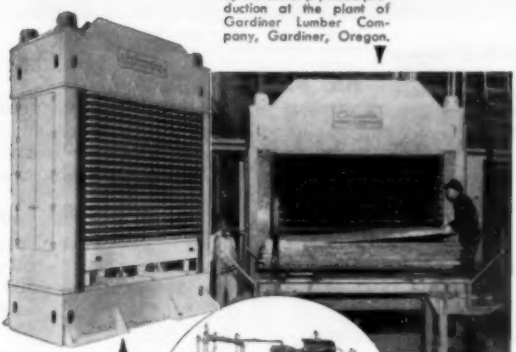


Figure IV.

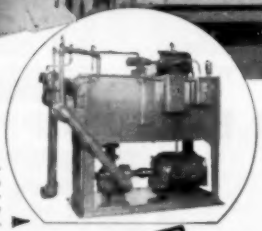
Smooth... PRODUCTION-PROVED PLYWOOD PRESSES

Columbia Hydraulic Hot Plate Press design exclusives are production-proved . . . and smooth . . . . .

One of two 4' x 8', sixteen opening Columbia Hydraulic Hot Plate Presses operated for plywood production at the plant of Gardiner Lumber Company, Gardiner, Oregon.



20 daylight Standard Columbia Hydraulic Hot Plate Press, open.



Columbia Hydraulic System showing arrangement for gravity feed to high volume pump.

Other Columbia design exclusives influence platen heating, labyrinth features, steam lines, opening and timing, pumps and pressure lines, and even use of materials.

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As required pressure is reached, the pump automatically reduces volume output to the amount necessary to maintain pressure throughout balance of curing cycle.

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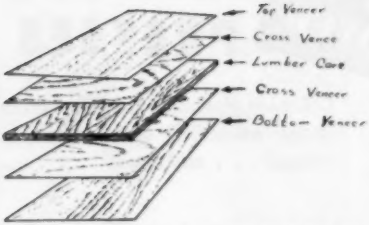


A blown up view of a standard lumber core furniture panel. A five ply construction such as this illustration will produce a stable panel, strong and resistant to warp.

eliminated the most serious faults and now the manufacturer of furniture can control the density and moisture repellent qualities by the type and percentage of resin, thus making it possible to produce a chip core to meet every need.

Favorable, too, is the fact that chip core can be made from waste, raw material that would otherwise be boiler fuel in the average furniture plant, with an initial investment as low as $65,000.

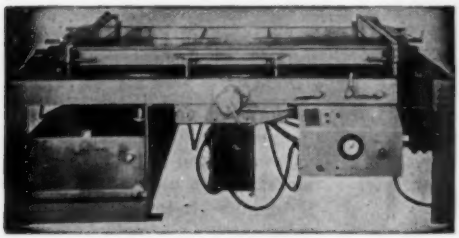
Chip cores can be banded, too. In the brief description of solid lumber banding which follows, no mention is made of chip cores. However, the author's experience with banding chip cores points to no new problems in this field. That which applies to solid lumber cores will apply to chip cores.

Why Not Band?

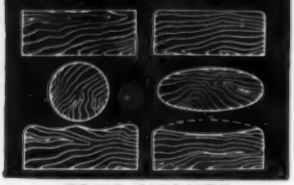
Critics of furniture manufactured from lumber cores have one objection that is well founded: the cores of different wood species show. Likewise the crossband is noticeable.

For example, a table top made of poplar core, veneered with mahogany, will have all the indications of a different wood unless skillfully finished. And then it is difficult to disguise end grain.

WELDON VENEER BANDING PRESS...



for such typical shapes as these



Here's a press that will take any shape panel . . . a few are pictured above. There are also other advantages, a few of which are listed. You can do your veneer banding job faster and better with a WELDON. Write today for complete data and list of users.

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There are three accepted methods of correcting this fault: (1) a veneer band glued to the core and over lapping the surface and crossbanding, (2) by staining the core to match the top surface or (3) by banding the core with solid lumber of the same species as the top veneers before the core is laminated.

The first method has definite advantages; likewise it poses problems. For instance, in a chest top that has a shaped moulding, banding with veneer is impossible.

On the other hand, the second solution is impractical where the end grain of the core is exposed. No amount of skillful staining can disguise the fact that end grain is end grain.

Lumber cores banded with solid lumber strips of the same species as the top veneer are both economical and satisfying from the appearance standpoint.

A desk top, table top or chest panel with intricate mouldings can be produced from cheap wood cores and banded with walnut or mahogany at a much lower price than if made from solid lumber of the same species. No end grain shows as the band is glued across the end grain of the core.

The economical banding of solid lumber cores for furniture panels requires considerable planning. The concern manufacturing panels of this type must first consider the manufacturing problems involved in producing bands economically. Likewise, the core size for banding must be carefully considered as well as the final thickness.

Bands Can Be Assembled Differently

There are several procedures for banding panels. The best method is that which most completely meets the end product demand.

Two general types of band assemblies are shown in Figure III. In A the end

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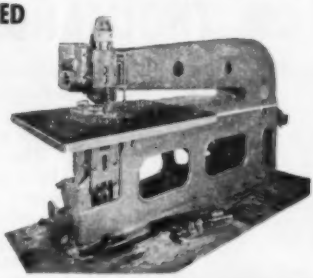

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band is glued to the end grain first; then the side band applied. The core in B is of the reverse construction. The side band is glued to the core first, then the end bands applied.

The first construction has several noteworthy advantages. The number one advantage, from a structural viewpoint, is strength. Since the end band strength depends upon the glue line along the end grain of the core, it is necessarily weaker than the side band. Therefore, it is structurally stronger with the side band overlapping.

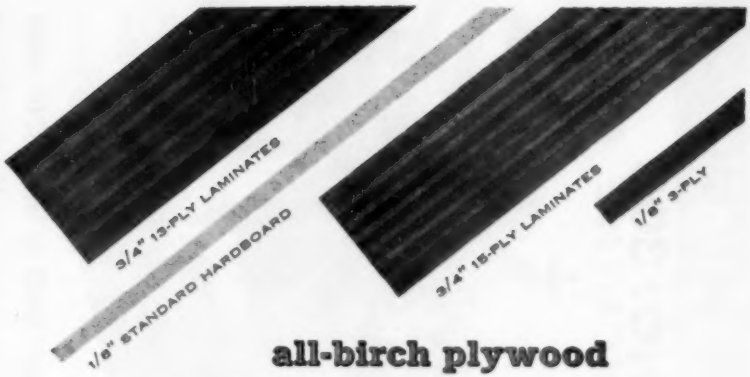
In manufacturing a body of this construction, the core is glued up with one inch trim allowance in the width and length. The first operation is cutting off before end banding. After the glue has completely set, the panel is trimmed for width and the side bands applied.

The second method of banding as illustrated in Figure III has a definite advantage in production. One factory where this construction is used, applies the two side bands at the time of gluing. It is necessary, however, to pre-shook the stock going to the clamps to an exact width, then add the two bands when gluing up the cores.

The second step is trimming to length after side banding. A square cut across the ends is a necessity if your finished core shapes after veneering. Assembling the end band poses the biggest headache for most concerns since the entire area is glued to end grain only. Your glue and proper assembly are the critical points to watch.

Special Banding Problems

A number of years ago a manufacturer of novelty furniture was faced with the problem of manufacturing a cocktail table of double top construction. The top leaf opened in the middle and folded back to make a long table. The problem—to manufacture the top



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in one piece, veneer with a crotch face, then open the table across the middle without showing the end grain of the core stock.

Figure 4 illustrates how the problem was solved. Two short core sections were glued as shown in A and end trimmed along lines AA'.

The next step was that of gluing in the insert as shown in Figure B. At the same time the two end bands were assembled. The panel was then ripped along lines BB' for side banding and the side bands glued into place.

There are several steps to keep in mind when constructing an insert type core: (1) the insert should be ripped to a width equal to twice the end bands to allow for extra saw kerf and shaping of the two surfaces. (2) When the insert is not in the exact center of a core its location from one end should be marked with crayon on the outside band. This mark is then transferred to the top veneer after laying to determine the location after the outside bands have been shaped off.

He who makes no mistakes never makes anything.

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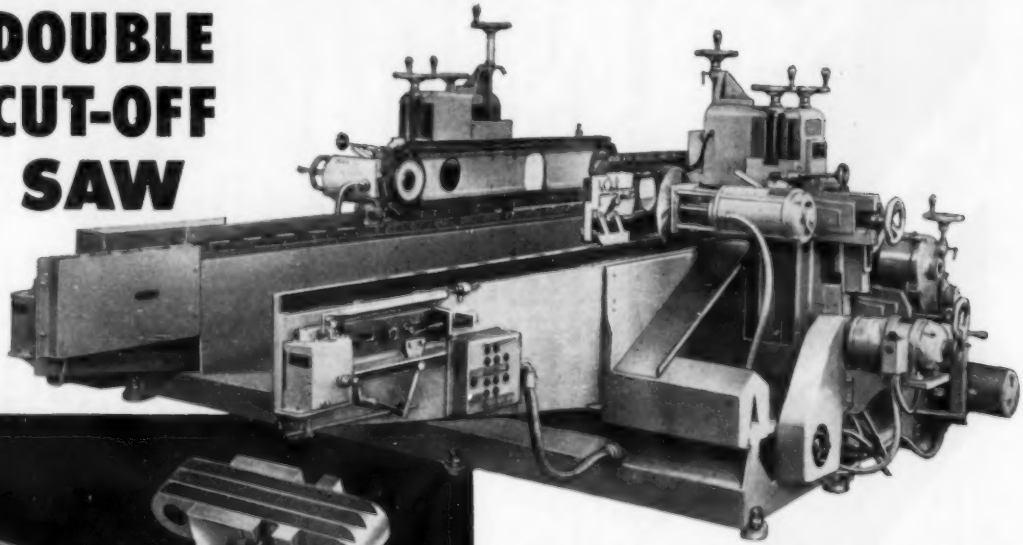

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This special chain is furnished on the M-J No. 300. Note the 45° angle of the three V grooves to prevent sideways movement. The inverted center link clearly illustrates the full length bearing surface in both horizontal and vertical planes. There is approximately 55% greater horizontal and 95% more vertical bearing area than with low angle single V-chain. Patented snap dogs are standard equipment.

be equipped with regular or high speed cope motors, stationary or jump dado arbor or other accessories as required. The sturdy, welded steel construction . . . rubber block hold-downs . . . snap-on feed dogs . . . and variable feed drive are only a few of its outstanding features.

Write for the No. 300 Bulletin

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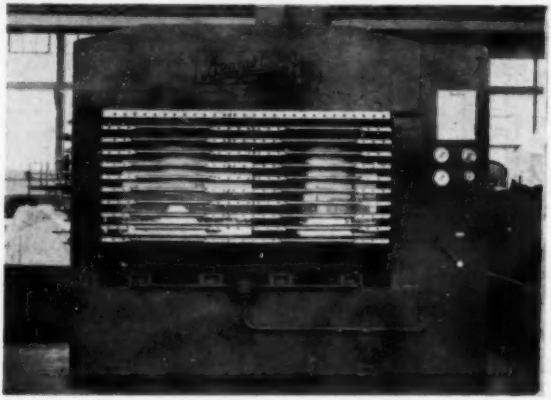

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Auditing Quality in WOOD PRODUCTS MANUFACTURE

By James S. Bethel

MOST manufacturing operations audit their books at regular intervals. Such an audit functions to indicate whether the organization's fiscal procedures are in order. In the same way a quality audit can indicate whether a company's quality control procedures are in order. If the quality audit is an internal one made by the company's own quality control personnel it serves as a self evaluation. If it is an external quality audit made by a qualified outside consultant it provides management with an unbiased appraisal of the manner in which it is discharging one of its most important obligations.

The quality survey can be said to be to the quality function what the commercial audit is to the accounting function. The commercial audit should inquire into the accuracy of the books, the bookkeeper, and also into the adequacy of the system. The quality audit should examine the accuracy of the product and of the inspectors, but it should also check the means of handling the quality function.

The quality audit should evaluate three important functions in quality control:

1. Specification of quality.
2. Actual status of quality.
3. Procedures for policing quality.

The specification of quality is a management obligation. If the quality control function is to be properly performed it is necessary that the target set by management be clearly defined and well understood by all components of the organization. A recent quality survey made at a wood product manufacturing plant disclosed that the product was supposed to be produced in accordance with a written published specification. It was being advertised and sold by the sales department as being in conformance with this standard. A discussion with representatives of executive management revealed that the actual standard envisaged by management was something quite different. Still further investigation showed that the standard contemplated by the production superintendent agreed with neither the written specification nor the stated objectives of management.

Finally a study of the actual quality of the product being produced by the plant proved that it did not agree with any of the three targets. The interesting feature of this survey was that it revealed that executive, sales and production personnel all felt that the company's quality target was well defined and understood and that quality problems were simply the result of failure

Mr. Bethel is director of the Wood Products Laboratory, North Carolina State College.

to hit the target. It is one of the important functions of a quality audit to reveal failures such as this in the specification of quality and to point to procedures for remedying them when they are uncovered. There are many different ways of specifying quality of wood products and the specific procedure used in any given situation will depend upon the nature of the product being manufactured, custom in the industry and past practice of the company. Generally when the specification can be reduced to print either in the form of a written description and/or a blueprint it is easier to insure its universal understanding than when it consists of verbal instructions, a physical sample or a set of patterns.

It should be a function of the quality audit to evaluate the tolerances being used. Sometimes the tolerances applicable to a given product are spelled out in the specifications or on the drawing. At other times they are not well defined. Plywood specifications, for example, usually define precisely the tolerances permitted in thickness, length, width and squareness. On the other hand in the manufacture of furniture it is not common procedure to specify tolerances and, in fact, it is not uncommon to encounter the statement that tolerances are not applicable to furniture manufacture because all parts have to be exactly the right size. Actually, of course, it is generally recognized that no operation produces all articles exactly alike. When tolerances are not well specified, unofficial shop tolerances are likely to be used and these may be excessively liberal resulting in non-uniform final product or in the expenditure of excessive time and money in re-work and hand fitting of parts.

Where tolerances are specified by designers or engineers they may not be realistic from the standpoint of the quality of raw material available or the inherent capability of the equipment or process being used to produce the item. A quality audit may well point out such weaknesses in specifications.

The second function of the quality audit is to evaluate the actual status of quality. It might be assumed that any manufacturing organization that is conscientiously trying to meet certain quality standards will know what its quality status is at any given time. Unfortunately this is not true. Gradual changes in manufacturing or inspection procedures leave their imprint on average product quality without its being noticed. It is the old situation of not being able to see the forest for the trees. A deliberate conscious effort to evaluate quality through a quality audit will frequently reveal changes in the quality of materials, processes and final products that were not even suspected. This is particularly likely to occur where the

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audit is made by an outside unbiased investigator.

The third function of the quality audit is that of examining the procedures for policing quality. An important feature of this activity is an evaluation of the allocation of quality function in the manufacturing organization. In many factories responsibility for policing quality is assigned directly to production personnel. In this situation the level of quality may reflect only the conditions of the market. In a seller's market when the emphasis is on high production rates quality may suffer. In a buyer's market a decreased pressure for high production rate and increased customer complaints may shift the emphasis from quantity to quality.

Customer complaints are frequently very poor criteria of quality. They increase during periods of low demand when quality is likely to be high and decrease during periods of high demand when quality is likely to be low. It may be that a quality audit will point to a re-allocation of quality control function designed to bring about a uniform quality level to the term advantage of the producer.

Where a systematic inspection procedure is in operation the quality audit should investigate the efficiency of the inspection operation. Inspectors may be poorly trained or inadequately compensated. Inspectors sometimes deliberately permit departures from specifications and standards in the interest of maintaining harmonious relations with production personnel! There is less frequently actual collusion between inspection and production personnel which results in non-uniform quality.

Inspection tools such as rules, gauges, meters, etc., may be in a poor state of maintenance. It is not uncommon to find that inspection is inefficient because the inspectors are inspecting the

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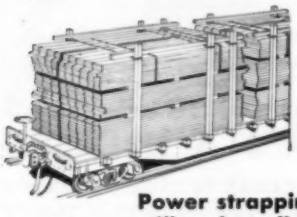

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wrong qualities. They may be checking the thing that is easiest to check rather than the thing that is most important to check. Inspection costs may be excessive where 100% inspection is being used in a situation where sampling inspection would do as well or better. Inspection fatigue may be robbing the inspection organization of its effectiveness. All of these possible defects in inspection operations and more are proper areas for investigation during a quality audit.

It is sometimes said that quality control is only for high priced "carriage trade" items and that close attention to quality such as that implied by the quality audit is not justified when a manufacturer is serving the low price market. However, regardless of low price, there is a point below which quality should never go. That is where the product, at least for a reasonable period of time, will not perform the functions for which it is intended. It should also be remembered that quality control functions not only to maintain uniform standards of quality at a level set by management; it also functions to reduce waste of materials, manpower, and machine time. The quality audit like the fiscal audit is simply a procedure for determining whether an important management function is being performed properly and efficiently.

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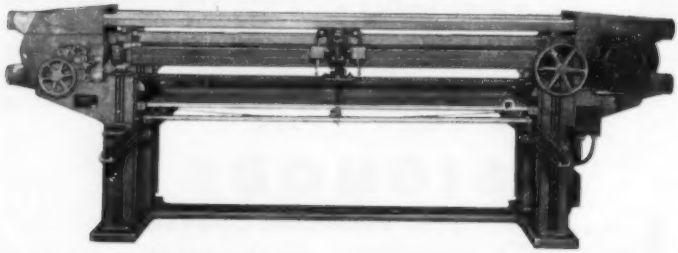
The OAKLEY D-1 DOUBLE BELT SANDER

• CUTS DOWN • POLISHES • ELIMINATES DRUM SANDER ON VENEERED STOCK • ELIMINATES RAISED GRAIN • ELIMINATES SPONGING • PRODUCES SUPERIOR QUALITY
ALL ACCOMPLISHED AT ONE OPERATION SEMI-AUTOMATICALLY AT HIGH SPEEDS



With a single handling, the Oakley D-1 Double Belt Sander removes the tape, polishes, eliminates raised grain . . . without sponging or glue sizing . . . and the stock is ready for the finishing room. This is only one of the many quality sanding machines designed and built by Oakley for the woodworking industry. Write today for full information.

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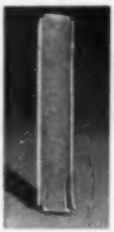

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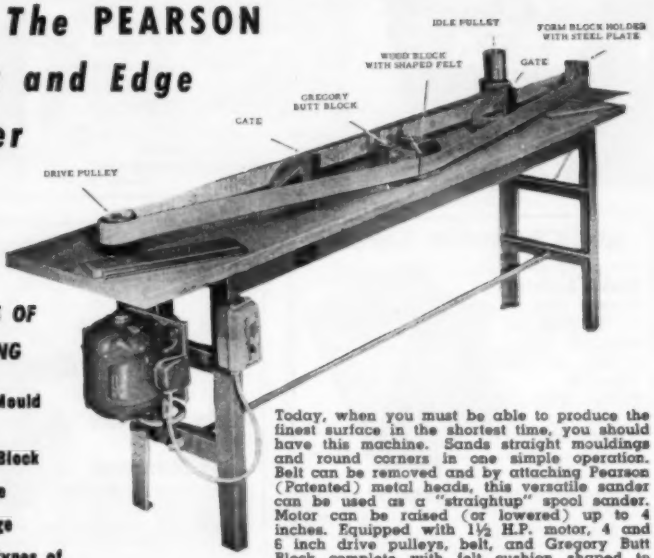

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Today, when you must be able to produce the finest surface in the shortest time, you should have this machine. Sands straight mouldings and round corners in one simple operation. Belt can be removed and by attaching Pearson (Patented) metal heads, this versatile sander can be used as a "straightup" spool sander. Motor can be raised (or lowered) up to 4 inches. Equipped with 1½ H.P. motor, 4 and 6 inch drive pulleys, belt, and Gregory Butt Block complete with felt cushion shaped to fit any one mould. Length of belt is 19 feet; table 24 inches wide. Overall length is 11 feet.

We Also manufacture Scroll and Drum Sanders.

Write for Complete Data

PEARSON SANDING MACHINE CO., INC.
HIGH POINT, N. C.

New Literature

In order to review many of the various brochures and catalogs distributed at the Forest Products Research Society Annual Meeting and Woodworkers' Industry Show, we are using a somewhat different presentation this month. The various pieces of literature are listed alphabetically by company name. We regret that it is impossible to include every manufacturer's material in this initial listing.

Other pieces will be reviewed in succeeding months. You may write to any of these manufacturers for a copy of the literature described.

Adjustable Clamp Co., 433 N. Ashland Ave., Chicago. A booklet describing the firm's hinged clamps—something new in

MAKE "CLEAN" MORTISES ON FAST SCHEDULES WITH GREENLEE TOOLS

To make *accurate* mortises easily, swiftly and economically, equip with *high quality* GREENLEE Hollow Chisels and Bits. Long-lived and fast-clearing, these GREENLEE tools add speed to your production, *precision* finish to your products. GREENLEE Hollow Chisels and Bits are made by the originators of hollow chisel mortisers. And GREENLEE produces a complete line of these tools for hard or soft wood and all makes of machines. Write for new illustrated folder M-159 describing these and other GREENLEE tools for mortising, boring, and routing. Greenlee Tool Co., 2136 Herbert Avenue, Rockford, Illinois.

TOOLS FOR CRAFTSMEN

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HOLLOW CHISELS • MACHINE BITS • DRILLS
ROUTING BITS • MULTI-SPUR BITS • PLUG
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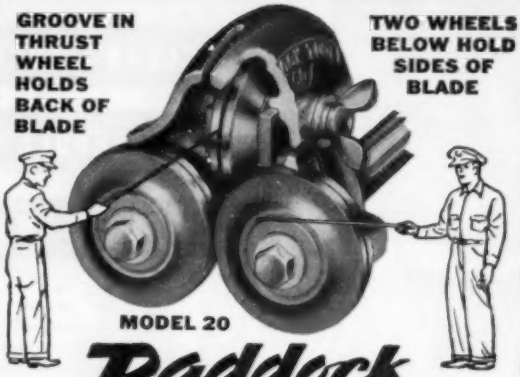
GROOVING TOOLS FOR TIMBER CONSTRUCTION

Sturdy, Strong, Band-Saw Guide



MODEL 20

Paddock

BALL-BEARING

BAND SAW GUIDES

EASY TO INSTALL—on machines having 2½" back of blade to guide post. Works above or below saw table. STURDY, SMOOTH PERFORMANCE — Interchangeable ball-bearing wheels run with blade to give friction free blade support. Note cut-away section in photo, revealing grooved wheel that supports back of blade. Two side wheels support sides of blade. Designed for ⅛ to 1¼" wide blades. Models for large or small machines. Write for circulars, prices, etc. Give size and make of machines on which guides will be used.

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WHERE VALUE IS QUESTIONED

PADDOCK TOOL COMPANY

GUIDE MAKERS SINCE 1920

1418 Walnut Street • Kansas City, Mo.

clamping jigs. The folder is well illustrated and shows how these clamps will be found adaptable to all types of fabricating and assembly operations in woodworking. The swivel plate can be mounted on any flat surface; the bar and head portion of the clamp, being hinged on the swivel plate, may then be positioned to clamp the work.

Aget-Detroit Company, 641 Main St., Ann Arbor, Mich. Two brochures—one on dust collecting equipment and another on the Econaway abrasive belt splicer. Thirty-two different models of dust collectors are available and this brochure illustrates many of them, including specifications and price. The belt splicer literature illustrates all of the steps necessary in splicing abrasive belts. With this machine, any length belt can be spliced without need of special training.

Bostitch, Westerly, R.I. "Candid Camera Shots That Make Moving Pictures

CUT FINISHING
COSTS 50%!
AIR MODEL
J-R
$69.50
DETROIT Easy FINISHERS
DO ALL THE JOB!
PROVEN TOPS for sanding white wood, water-fall fronts, sealer coats - SEALING END GRAIN - padding in filler - rubbing final coats. There's no substitute for EASY Straight-Line Action.
Model DF
Electric
For working hard to get at areas, simply adjust pad up to 1½" either side.
FREE TRIAL
Ask your Jobber or write us.
Model AF
Larger Air
Ask Your Jobber or Write for Catalog.
DSM
DETROIT SURFACING MACHINE COMPANY
1278 E. Eight Mile Rd. Detroit 20, Mich.

in the Furniture Industry," a four-page folder showing actual operations in a furniture factory where Bostitch fastener driving equipment is used. Six different types of Bostitch lighter machines are illustrated and three of the firm's floor models. Another feature of the folder is a list of some 40 uses for Bostitch equipment.

The Bouligny Company, Charlotte, N.C. The Molsander Model 100 is well illustrated and described in a four-page folder. This machine handles work 8" wide or high. This machine can be used for belt sanding of moldings and straight edges. It sands most beading, ogee molding, crown molding, nosing shapes and other unusual moldings. It will also sand the edge of bed rails, drawer sides and some types of drawer fronts. Contours can be sanded to maintain the original shape. The machine is available in either one or two head models.

With "Multiple Disc Clutch" that moves up to the work instantly and holds firmly . . . quickly released. Steel bar of greatest strength — no notches. Screws of cold drawn steel. "JORGENSEN" Style No. 70 I-bar clamps are the craftsman's favorite. Many other styles available — deep reach, sliding head, etc. Ask your dealer or write factory.

insist on genuine

"Jorgensen" **HANDSCREWS**

Hard maple jaws that stand up under severe service . . . steel spindles. Look for trade mark "JORGENSEN" on jaws. Write for . . .

free catalog of Clamp Fixtures, "C" Clamps, Press Screws, etc.

ADJUSTABLE CLAMP CO.
418 No. Ashland Ave. • Chicago 22, Ill.

California Redwood Association, 576 Sacramento St., San Francisco, Calif. This association has published a number of leaflets giving information about machining, gluing and utilizations of redwood. All of them contain a great deal of factual information and are well illustrated. The use of redwood is growing and these leaflets will be exceedingly helpful.

Cincinnati Tool Co., Cincinnati 12, Ohio. In an eight-page leaflet Hargrave clamps are fully illustrated and specifications given. The I-bar, miter-frame, super-junior and standard carriage clamp are included as well as a clamp fixture and steel spindle hand screws.

Dependable Machine Co., Greensboro, N.C. This firm has included a number of grinders in an eight-page folder. Also illustrated are: knife jointers, gang rip saws and electro-unit drive moulders. The Dependable Machine Company also manufactures cutter heads and knifes.

NEW 1954 MODELS

LIGHT AS YOU WANT IT
for Machine Tools, Assembly and Inspection Benches

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FINEST OF ALL LOCAL LIGHTING

MODEL 2-MH-760
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Reflector—5" long x 3 7/8" wide x 3" deep. Rotates 360°. Accommodates 100 watt A-21 or 60 watt A-19 lamp.

Arm Joints—New patented tension disc design. Easy, smooth action with only one hand. Available with 1, 2 or 3 arms.

Base—Universal for vertical or horizontal mounting. Also adaptable to outlet boxes. Collet revolves 360°.

Wiring — McGill industrial socket 4101-FL with Levolier switch. 8 ft. POT-32 18-2 heavily insulated oil resistant wiring with molded plug.

Finish—Gray baked enamel. Reflector interior, high temperature White.

WRITE for complete catalog of Localite models for every industrial use.

THE FOSTORIA PRESSED STEEL CORPORATION
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Localites available through wholesalers everywhere

LOCALITE fostoria for Light ON the Job
Reg. U. S. Pat. Off.

Each machine is illustrated and briefly described.

DeWalt Inc., Lancaster, Penn. The DeWalt all-purpose saw is fully described and illustrated in a folder called "DeWalt Model GA." This saw can be used as a cutoff, miter, rip, double miter and a variety saw. Other uses include dadoing, gaining, grooving, rabbeting, routing, tenoning and shaping. The folder gives complete specifications and many illustrations of the machine.

G. M. Diehl Machine Works, Inc., Dept. WWD, Wabash, Ind. This firm issued a special number of "The Diehlcrafter" for the Woodworkers' Industry Show. This issue told of specific installations where Diehl machines were being used. The machines described included: the Diehl straight line glue joint rip saw, Diehl-Vonnegut moulders and Diehl tapeless veneer splicers. These short operational stories describe the machines and their operation.

Alexander Dodds Company, 451 Monroe Ave., N.W., Grand Rapids, Mich.

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SUPERIOR chain mortise cutting equipment made possible through Field research and experience. . . . Many profit making improvements which you can test for yourself. Cut costs . . . raise quality . . . increase production with Field mortising equipment.

More than 90 standard sizes of cutting equipment to assure you an excellent product and interchangeable replacement parts.

Write for information on our chain grinders for sharpening your mortise chains.

Complete mortising equipment at . . .

WILLIAM H. FIELD CO.
327 Dorchester Ave.
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This firm manufactures a dovetailing machine, described in the literature as a "fully automatic dovetailer with air clamping." The machine is illustrated and fully described. It is available in five sizes, ranging from 10 to 25 spindles. The following cuts are possible with this machine: two sides or four sides at the same time; two backs or two fronts at the same time, or one back or front and one side at the same time.

Duro Metal Products, 2651 N. Kildare, Chicago 39, Ill. Several pieces of literature describe this firm's drill presses. Both a 15½" and an 18" production drill press are available. These Duro drill presses can be used for a variety of jobs including mortising, routing and shaping. Drill accessories are also described in the literature.

Edmont Mfg. Co., Coshocton, Ohio. Job-fitted industrial work gloves are described in a piece of literature circulated by this company. A table lists the performance and chemical resistance preference of each of the five types of gloves made by this firm.

Ekstrom, Carlson & Co., Rockford, Ill. Along with its fiftieth anniversary, this company presented its entire woodworking line in an especially attractive booklet. The story of the firm is told and a picture of the plant included. At least 18 machines are illustrated and described. An explanation is given of the firm's special woodworking machinery made to order. The last several pages of the booklet are given to the firm's cutterheads, knives, router bits and form cutters.

Enterprise Company, Columbiana, Ohio. This company had several pieces of literature: Bulletin No. 201-A, describing sawmills; Bulletin No. 204-A, planers; Bulletin No. 205-A, band saws. Each leaflet illustrates the machine; gives specifications, including principal dimensions and describes special features of these machines .

Fastener Corporation, 860 Fletcher St., Chicago 14, Ill. The Fastener Corporation illustrates its complete line of

Duo-Fast automatic tackers, staplers and staples in a brochure. Size of staples and performances are included for each machine.

Fiberesin Plastics Co., Oconomowoc, Wis. A four-page folder describes Fiberesin board and its many uses. It has been successfully used as the material for school desk tops. The folder describes the board and finishes in which it is available. Characteristics which contribute toward the material's durability are also discussed.

William H. Field Company, 323 Dorchester Ave., Boston, Mass. The Field router bit grinder is presented in a piece of literature by the same title. Here the machine is illustrated and completely described. Operational pictures show setup and types of grinding done. Specifications are included.

(To be Continued)

Great works are performed not by strength, but by perseverance.

"Boss, we're going to have to have some extra pay if we're going to continue taking coffee breaks!"

FIELD
SINCE 1880

ROUTER BIT GRINDER

FOR
SHARPENING
- **ROUTER BITS**
- **DOVETAIL BITS**
- **3 LIP CUTTERS**

and Many Other Cutting Tools Including Carbide Cutters

The primary purpose of this motorized, positive indexing Router Bit Grinder is to eliminate freehand grinding on hundreds of small cutting tools. The machine sharpens high speed and carbide cutters on an entirely mechanical basis, with extreme precision, saving cutter life and improving quality and quantity of production. Write for circular.

Manufactured by

WILLIAM H. FIELD CO.
327 Dorchester Ave.
Boston 27, Mass.

boost production ...cut costs

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The Hard-Pressed Wood Fiber Panel that is ALL Wood

Alert management on the lookout for a superior fabricating material can fill a great many material requirements with Allwood Hardboard. Find out now how this amazing product can pay off in *your* business. Write for details.

SMOOTH, HARD, DURABLE
Inherent strength and wearability for fabrication of better products.

GRAINLESS
Equally strong in both lateral dimensions — won't split, splinter or crack.

FLAWLESS
Carefully controlled manufacture and inspection warrant every piece usable . . . minimum waste.

CUT TO SIZE
Large panels up to 4'x16', or any size cut to order. Thicknesses: 1/8", 3/16", 1/4".

TOUGH RESISTANCE
Resists abrasion, moisture, mild acids, food and other odors. For inside and outside use.

ASSURED SAVINGS ON
● **Materials** ● **Time** ● **Labor**

OREGON LUMBER COMPANY ALLWOOD HARDBOARD DIVISION
DEE, OREGON

*T.M. Oregon Lumber Co.

F. P. R. S. Notes

ALMOST 1,000 wood industry production men and technologists gathered at Grand Rapids, Michigan, May 5-7, for the three day Eighth National Meeting of the Forest Products Research Society. An additional several thousand persons attended the Woodworkers' Industry Show which was held at the Civic Auditorium in cooperation with the F.P.R.S. meeting. The Forest Products Research Society returned to Grand Rapids as a national group for the first time in five years, the third national meeting of the society having been held at the Pantlind Hotel in 1949.

The Forest Products Research Society was formed in 1947 for the purpose of stimulating better use of our forest resources. This purpose calls for interest in forest products education, wood machining and equipment, wood preservation, wood drying, logging and milling, packaging, wood composition materials, glues and gluing, wood finishing, quality control, chemical utilization, veneer and plywood, wood construction and marketing. The membership of some 2,700 includes researchers, technologists and production experts. Main offices of the Forest Products Research Society are located at Madison, Wisconsin.

The May issue of WOOD WORKING DIGEST carried the technical program and from time to time we shall reprint some of the papers which were presented so that all of our readers can share this information. The entire technical program was very well received and lively discussion followed a number of the sessions.

Business Meeting

During the annual business meeting, election of new officers took place as well as the introduction of several new policies. The board announced to its 2,700 members preliminary plans to proceed with the construction of a new F.P.R.S. executive office building in Madison, Wis., possibly early in 1955.

Locations for the next two annual meetings were established. The 1955 Ninth National Meeting will be held June 20-23, at the Olympic Hotel, Seattle, Washington, under the general chairmanship of the newly elected northwest regional board member John D. Ritchie. The executive board also voted to hold its 1956 National Meeting in Asheville, N.C., under the general chairmanship of Dr. Ellwood S. Harrar, Duke University, Durham, N.C.

The three day Industry Show seems to have been of particular value to the entire industry. It provided opportunity for the demonstration of a number of new machines and techniques and gave new enthusiasm to every woodworker who attended.

New Officers

President—Lester J. Carr

Lester J. Carr, president of L. J. Carr & Co., Sacramento, Calif., succeeded to the presidency of the Forest Products Research Society for 1954-55 during the Eighth National Meeting of the F.P.R.S. at Grand Rapids, Michigan, May 5-7. He has been active in the lumber industry since 1923, forming his company in 1935. Carr, who was elected president-elect at the last national meeting at Memphis, Tennessee in June 1953,

joined the society in 1948. One of the original founding members of the Northern California Section, he served as southwest regional board member for three years. He was elected vice-president in 1952.

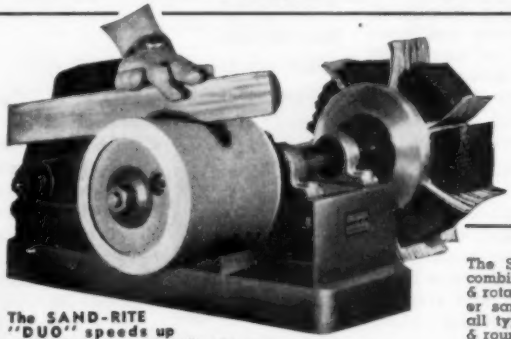
President-Elect—Moss B. Christian

Moss B. Christian, director of research for the Chicago Mill and Lumber Co., Talullah, La., previously vice-president, has been elected president-elect. Christian was general chairman of the 1953 National Meeting at Memphis, Tenn. He is a past south-central regional board member—having served in that capacity for three years. He has been director of research at Chicago Mill and Lumber Co. since 1942.

Past President—Robert D. Pauley

Robert D. Pauley, manager of the Special Products Division of the Weyerhaeuser Timber Co., Tacoma, Wash., automatically became past-president. Pauley has guided the affairs of the society during the past year in which the total membership in more than 25 countries has risen to over 2,600. A charter F.P.R.S., he has served as northwest regional board member from 1948-1951, Chairman of the executive board sub-committee on regional and sectional boundaries, as general chairman of the society's 1950 meeting and show held in Portland, Ore., as national chairman of the membership and finance committees, and as vice-president.

INCREASE SANDING PRODUCTION



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The SAND-RITE "DUO" speeds up production at lower costs on:

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The SAND-RITE "DUO" is a combination pneumatic drum & rotary brush sander for faster sanding & lower costs on all types of irregular shaped & rounded contour wood products. Eliminate costly hand sanding & maintain top quality finishes by using the "DUO" Sander.

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Vice-President—Ralph H. Bescher

Ralph H. Bescher, Pittsburgh district manager of sales and operations of the Wood Preserving Division of Koppers Company, Inc., has been elected vice-president. He recently served a full term as National President of the American Wood Preservers Association. He is a past north-central regional board member having served from 1948 through 1951.

Board Member—Frank T. Parrish

Frank T. Parrish, experimental and development director, Heywood-Wakefield Co., Gardner, Mass., has been elected to the post of northeast regional board member. Parrish was technical advisor of industrial arts at the New York Museum of Modern Art before his work with Heywood-Wakefield and is a graduate of Wentworth Institute, Boston, Mass.

Board Member—John D. Ritchie

John D. Ritchie, Allied Products Director, Douglas Fir Plywood Association, was elected northwest regional board member. Ritchie has been with the Douglas Fir Plywood Association for over 16 years. He was the chief of the testing laboratory there before being promoted to his present position. Mr. Ritchie has served F.P.R.S. variously, in section and national posts.

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Newly Elected Executive Board

President

Lester J. Carr, L. J. Carr & Co.,
P. O. Box 1282, Sacramento, Calif.

President-Elect

Moss B. Christian, Director of Research, Chicago Mill & Lumber Co., Tallulah, La.

Vice-President

Ralph H. Bescher, District Manager of Sales and Operations, Wood Preserving Division, Koppers Co., Inc., Pittsburgh, Pa.

Past-President

Robert D. Pauley, Manager, Special Products Division, Weyerhaeuser Timber Co., Tacoma Building, Tacoma, Washington.

Executive Secretary

Frank J. Rovsek, Box 2010,
University Station, Madison 5, Wisconsin

Northeast Regional Board Member

Frank T. Parrish, Experimental and Development Manager, Heywood-Wakefield Co., Gardner, Mass.

Northwest Regional Board Member

John D. Ritchie, Allied Products Director, Douglas Fir Plywood Association, Tacoma, Washington

North-Central Regional Board Member

J. Alfred Hall, Director, Forest Products Laboratory, U. S. Department of Agriculture, Madison, Wis.

Southeast Regional Board Member

Ellwood S. Harrar, P. O. Box FM, Duke University Station, Durham, North Carolina

South-Central Regional Board Member

W. Jeter Eason, Nickey Bros., 2700 Summer Ave., Memphis 12, Tenn.

Southwest Regional Board Member

Ray E. Shreck, Director, Research & Development, Union Lumber Co., 620 Market St., San Francisco, Calif.

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EASY TO operate, works with lever action forcing table top apart.

CANNOT jar open. Send top size today for free sample.

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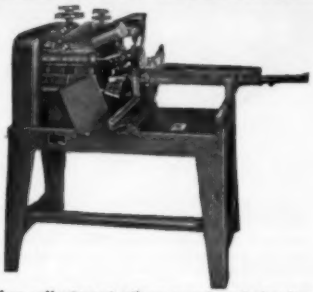
DELUXE FLOOR MODEL TENONER



New adjustment allows exact and simultaneous adjustment of tenon spindles.
3 H.P. Motor.
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V Belt pulley drive on both tenon and cope spindles.
Heavier Construction for greater accuracy

MILLBURY MACHINE COMPANY
13 WATERS STREET, MILLBURY, MASS.

Cuts up to 2"

LESTO
7 Saws in 1

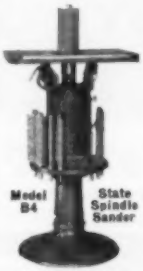
Qt. Pt. ½ Pt.

GLUE APPLICATORS!!

Ideal for White Resin Glues and other adhesives. Flexible Plastic Non-stik type applicator containers in ½ Pt., pint and quart sizes. Clean, easy and economical to use. Tops unscrew for easy refilling. Saves time and glue. Thousands of satisfied users. Write for prices today.

LESTO (Original Scintz) Electric Hand Saw. World's most amazing precision Hand Saw. Cuts up to 2". GEBII (Illustrated) $138.50. State Oscillating Spindle Sanders (2 sizes S-3 with Spindles Capacity ½" to 3" in 9 sizes. B-4 with spindles capacity ¼" to 4" in 10 sizes. State 15" and 20" Disc Sanders. Write for prices.

Machinery & Supplies for Woodworking Industry. Portable Tools, Plastic Wood, Wood Dough, White Resin Glue, Band Saws & Guides, Blades, Abrasives, wood screws, wood dowels.



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State Spindle Sander

Also 15" & 20" Disc Sanders

GLASS CITY SALES & SUPPLY
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Since 1915

Single Bar Clamps

Style No. 16, adjustable head piece only

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Quick adjusting, self-locking and unlocking . . . both styles tested for safe clamping strain of 1800 lbs.

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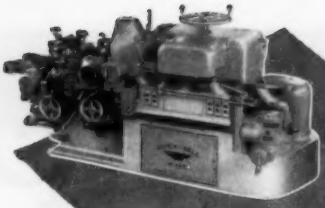
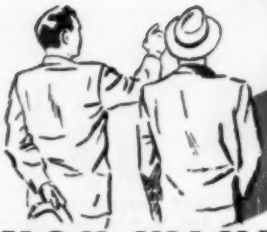


what should you look for in the MOULDER you want?



YOU WANT

1. **Quick Changes in Set-Ups**—Nothing could be speedier than Dependable's removable cartridge type spindles!
2. **Variable Speed Drive**—The exact speed you want for proper finish, infinitely variable up to 150 FPM.
3. **Removable steel wear plate**—in table under top head — precision ground, hardened tool steel.
4. **Heavy, rugged, hardened Chipbreakers.**
5. **Large head-swing circles** for deep cuts on all four heads!
6. **High head speeds**—4000, 5000, and even 6000 RPM — Without using frequency changer!
7. **Jointed, Multiple-Knife Work** for superior finishes. Dependable's newly improved jointing attachments are precision-made.
8. **Rugged, maintenance-free Feedworks** with "lots of beef."

compare these points

MOULDER A	MOULDER B	THE DEPENDABLE MOULDER
Four fixed feed speeds. Built in special motors. Awkward, inaccessible, clumsy to set heads and work around. Swing circles limited to 8".	Eight fixed feed speeds (by changing belts and using two-speed motor). Built in special motors. Many adjustments must be made in rear and machine doesn't open up sufficiently. Swing circles limited to 7".	Variable Feeds from 20 to 150 FPM. Standard Stock Motors. Opens up easily, locks open, accessible, drop bed table, convenient. Largest swing circles on the market — 9" on side heads, 10" top and bottom. — Unexcelled for deep pattern work.

Be Pleasantly Surprised! Write for catalog, quotation, specifications, prices. Learn that you can have premium features without premium prices.

Dependable MACHINE COMPANY

WOODWORKING MACHINERY

GREENSBORO, NO. CAR., U.S.A.

CONTEST WINNERS ANNOUNCED...

Grand Rapids Press Photographer.

Award of Merit citations are presented by Robert C. Van Kampen, president of Hitchcock Publishing Co., second from right, front row. Winners, first row: John Reno, Mrs. Emilie Russert, Ted Connelly. Second row: E. Howard Gatewood, Robert Bloomenstein, L. J. Jaworski, Samuel S. Auchincloss and John Cox.

AWARD of Merit winners were presented with their citations at the National Meeting of the Forest Products Research Society, held at Grand Rapids, Mich., May 5-7. The presentations were made by Robert C. Van Kampen, president of the Hitchcock Publishing Co. and publisher of WOOD WORKING DIGEST.

This contest was the first of its kind —sponsored to encourage and promote the utilization of wood over other materials. The citations given the winners read in part:

"In recognition of the assistance which this organization has given in advancing public understanding of the advantages, values and uses of wood over other materials. Wood plays an important part in our American heritage and tradition. May this award encourage the recipient to continue the splendid work which is hereby recognized in the furtherance of wood and wood utilization."

Three trade associations and five firms in the wood products field were awarded plaques printed on German parchment, beautifully hand finished, and mounted on a solid walnut base with a recessed glass face.

Here are the classifications and the winners.

Classification A — Lumber, Dimension Stock, Veneer and Plywood.

First place to company—The Pacific Lumber Company.

First place to association—Hardwood Exhibit, Inc.

Honorable Mention—West Coast Lumbermen's Association.

Classification B—Products Made From Wood Waste.

First place—Kingsford Chemical Company.

Classification C—Finished Wood Products Such As Furniture, Flooring, Toys, Etc.

First place to company—E. L. Bruce Company.

First place to association—Wood Office Furniture Institute.

Classification E—Materials and Machinery That Make Possible An Expanded Use of Wood.

First place—DeWalt Inc.

Honorable Mention—The Borden Co.

Accepting the plaques were Ted Connelly for the Hardwoods Exhibit committee; Robert Bloomenstein for the West Coast Lumbermen's Association; John Reno for The Pacific Lumber Co.; Mrs. Emilie Russert for the Kingsford Chemical Co.; E. Howard Gatewood for the Wood Office Furniture Institute; John Cox for the E. L. Bruce Co.; Samuel S. Auchincloss for DeWalt Inc.; and L. J. Jaworski for The Borden Co.

Complete stories of the winners and their presentations will be presented in the WOOD WORKING DIGEST Directory, which will be published this fall.

The second annual Award of Merit Contest will be held next winter and entries will be judged on the basis of the work done during 1954 to promote the use of wood and wood products.

NEW PLANT FOR DAY

The Day Company, Minneapolis, Minnesota, one of the nation's largest manufacturers of dust control equipment, and also bulk material storing and handling equipment, is expanding production facilities with the purchase of the factory building at 1153 Sixteenth Ave., S. E., Minneapolis. A. B. Osgood, president of the Day Company, states that the new facilities provided by plant number two will be used to manufacture equipment for their custom-built dust control systems, while the main plant at Third Avenue N. E. and Tenth Street N. E., Minneapolis, will be streamlined to produce their standard dust control equipment, including the Day type "AC" automatic continuous dust filter, and the bulk material handling equipment. The Day Company operates six plants in the United States and Canada.

ASSOCIATION OF MANUFACTURERS OF WOODWORKING MACHINERY ELECTS

The Association of Manufacturers of Woodworking Machinery elected officers at the fifty-fourth annual meeting, held recently at Colorado Springs, Colorado. Ray C. DuBrucq was re-elected president. Other officers are: J. H. Petter, Buss Machine Works, Holland, Mich., vice-president; F. G. Walker, Jones Superior Machine Co., Chicago, treasurer; George F. Newman, Jr., Newman Machine Co., Inc., Greensboro, N. C., secretary.

Highlights of the program included several talks, a round table discussion and a special reception for members and their wives.

NATIONAL HOUSING CENTER

The National Association of Home Builders has awarded a contract for construction of its new two million dollar National Housing Center to be erected in Washington, D. C.

The building site at 1623-25 L St., N. W. in midtown Washington already has been cleared and formal groundbreaking ceremonies were held, May 17, in conjunction with the annual Spring meeting of NAHB's National Board of Directors.

Drive and draw 'em FASTER

with "YANKEE"® Spiral Ratchet Screwdriver

No matter what type of work you do, you'll do it faster with this smooth-operating "YANKEE" Spiral Ratchet Screwdriver. Just a push drives and draws screws—quick-return action brings handle back automatically after each stroke. It's a real time- and work-saver!

No. 130A

Drill 'em faster, TRUER

with Russell Jennings® bits

No. 100ED

The new Russell Jennings Power Bits feature 50-50 Brad-Screw points. Full control: — single thread point feeds bit quickly, interrupted thread releases bit instantly. 11 sizes from ¼" to 1". Use in electric drill, press or lathe. A long line of Russell Jennings Machine Bits also available. Inquiries on special-purpose bits invited.

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Construction will begin immediately, the NAHB officials said, and the National Housing Center will open its doors in approximately one year.

The eight-story, air-conditioned structure will serve as both a headquarters for the NAHB and a permanent exhibit center for all the latest developments in the design, construction techniques, materials and workmanship that go into American home building.

RED CEDAR ASSOCIATION

Manufacturers of western red cedar lumber from Washington and British Columbia formed the Western Red Cedar Association in April to promote the sale and wider use of siding and lumber made from this wood.

Temporary headquarters have been established at 4444 Stuart Building in Seattle and candidates for association manager are being interviewed for their qualifications by the newly-formed group.

AW Quality

BASS WOOD
LUMBER CORE
to Your Specifications

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GLUED-UP
DIMENSION
IN BIRCH
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R. M. Ingram, president of the E. C. Miller Cedar Lumber Company at Aberdeen, was elected president. D. Johnston, Flavelle Cedar Limited of Port Moody, B. C. was named vice-president, and J. A. McCrory, Seattle Cedar Lumber Manufacturing Company, assumes the duties of secretary-treasurer.

Appointments

Fred H. Ludwig, Reading, Pa., has been elected president of Pennsylvania Lumbermens Mutual Insurance Company, Philadelphia, Pa.

General Manager of the Solar-Sturges Manufacturing Div., Pressed Steel Car Co., Inc., Melrose Park, Ill., is **George W. Stanley.**

C. Miles Burpee of New York City has assumed his new position as secretary-manager of the Service Bureau, American Wood Preservers' Association, Chicago, Ill.

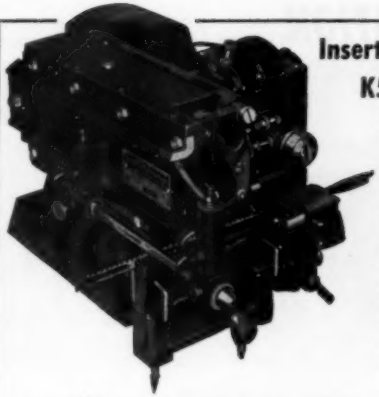
Arabol Manufacturing Co. has elected **Henry E. Weingartner** executive vice-president. Arabol manufactures adhesives.

Max C. Hanisch, Jr., president of Unit Structures, Inc., Peshtigo, Wis., has been elected president of the American Institute of Timber Construction. The national organization is composed of firms engaged in the design, fabrication and erection of engineered timber construction.

The Splicedwood Corporation, Mellen, Wis., has elected **John D. Campbell** to the office of vice-president.

President of the Prefabricated Home Manufacturers' Institute is **Gen. John J. O'Brien**, president of United States Steel Homes, Inc., New Albany, Ind. **P. S. Knox, Jr.** is vice-president and **George R. Price**, secretary-treasurer.

Compare your griefs with other men's and they will seem less.



Insert Band Saw . . . then forget it

K5 does the rest . . .

files, sets, joints

All in ONE Set Up

Fully automatic. Does the work which formerly required two machines in—**half** the time. Saw is rigidly locked by solid steel cam when being filed and set. Operates at a speed of 60 teeth per minute. Teeth are absolutely accurate and uniform.

The Wardwell K5 insures a tremendous saving on saw maintenance. It creates keen, fast cutting teeth that **stay** sharp longer.

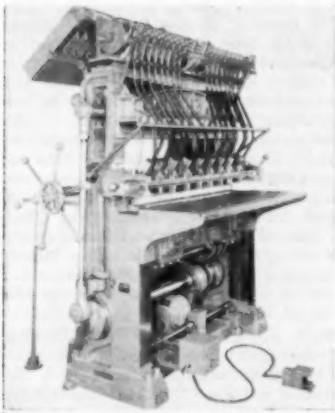
Let this remarkable machine save money for you as it is doing for so many others.

Write for Bulletin K-5.

WARDWELL MANUFACTURING COMPANY

3806 RIDGE ROAD **CLEVELAND 9, OHIO**

Maker of the largest line of saw and tool sharpening machines.



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THOUSANDS OF PROBLEMS HAVE BEEN SOLVED BY

DOIG AUTOMATIC NAILERS

Standard Doig Features

1. Anti-friction bearings.
2. Three separate motorized drives.
3. Nail feeder to handle nails from 1 to 3 inches without additional parts required.
4. Nail feeders to give 12 separate nailing combinations.

NEW FEATURES

A. Wheel on left allows operator to adjust back gage from operating position.

B. Solenoid trip permits operator to trip machine at any position desired.

WRITE TODAY. WE INVITE YOUR REQUESTS FOR FULL DETAILS

WILLIAM S. DOIG Inc.

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DRY KILN INSTALLATION

A new controlled dry kiln has recently been put into operation by the Stowell-MacGregor Division, Coats & Clark, Inc., Dixfield, Maine. The Stowell-MacGregor Division, one of the larger wood turners, manufactures thread spools, toy parts, handles, adding machine rolls, dowels, etc. Before this kiln was installed H. A. Patterson, the manager of the Stowell-MacGregor Division, made an intensive investigation and visits to many other kilns studying both into the matter of design and construction. He also had as background the years of experience with very modern internal fan kilns installed at that plant in 1940 and 1942 and so is very well acquainted with past and present design and equipment. The kiln just constructed is of prefabricated construction and is a very new improvement in orthodox dry kiln design and dry kiln building.

The kiln equipment and prefabricated building were provided by the Standard Dry Kiln Company of Indianapolis, Indiana. The foundation, concrete work and the erection of the protecting sheds were done by K & H Foster, contractors, of Wilton, Maine. The erection of the kiln was done by Stowell-MacGregor Division personnel under the supervision of Harry L. Nevison, Standard Dry Kiln engineer, and Ezra L. Masterman, Dixfield plant engineer.

The sidewalls and roof of the kiln are made up of 2" and 3" thick aluminum panels mounted on structural steel. The panels are of an all-aluminum envelope type with three or more layers of vapor seal insulating core. The insulating value of the walls is equal to 27.8" of common brick and that of the roof is equal to 41.7" of common brick.

The interior of the kiln has steam coils of fin type radiation for providing heat, equipment to provide humidity in the nature of a steam spray and six direct driven fans which provide air circulation. The fans are faced in the direction of the air travel through the lumber. The direction of the flow of air is automatically reversed every six hours. The motors to the fans are of special construction, employing glass and silicone insulation and sealed bearings using silicone grease. The kiln is designed with baffles so the circulation of air is forced to pass between the layers of lumber.

When the kiln is filled with lumber and the doors are closed, the instruments are turned on, after which the operation is fully automatic. Electrically operated Foxboro instruments turn the steam heat and steam spray on and off, and open and close the twelve vents on the roof depending upon the relative humidity in the kiln. The Foxboro controller also records both the dry and

wet bulb temperatures. Considerable steam saving is effected by the fact that the automatic dampers are so designed that they are never open when the steam spray humidifiers are on; whereas, in the older type of kilns even with automatic controls, fresh air was being vented and fresh air brought in at the same time the steam spray humidifier would operate.

There are two sets of tracks running completely through the kiln and under the protecting shed roofs outside. There are six kiln trucks on each set of tracks, three of each inside the kiln containing lumber in the drying stage, and three are outside underneath the sheds being either unloaded or loaded for the next kiln charge. These six trucks will hold approximately 20,000 bd. ft. of the hardwood square bars which measure 48" long and the operation is designed so that the bars can be handled either manually or with a forklift truck. When the load in the kiln has become sufficiently dry and the doors are opened, the six cars on the track are hooked together with cables. In a matter of a few moments it is possible to unload the dry kiln and fill it with green bars for the next drying by a towing tractor connected to the cables.

The drying rate is approximately 50% faster than the company has been able to do in their older kilns which are of masonry construction and have less air circulation. When the lumber goes into the kiln green, it weighs approximately 8,000 pounds per thousand bd. ft. and when it comes out at the 12% moisture content, it weighs about 4,000 lbs. This means that during the drying period, there was removed 80,000 lbs. of water, which is equivalent to about 10,000 gallons, from the 20,000 bd. ft. of lumber. Mr. Patterson says, "The quality of the drying is excellent and we have been able to obtain square bars with absolutely no discoloration."

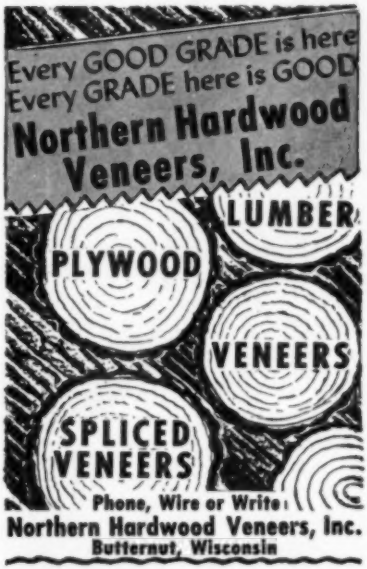
The man who trusts other men will make fewer mistakes than he who distrusts them.

"DE-STA-CO" CLAMP

Detroit Stamping Company, 312 Midland, Detroit, Mich., manufacturer of "De-Sta-Co" quick-acting production toggle clamps, has announced a new type of bushing for series 210, 220, 228 and 240. For some years a feature of De-Sta-Co heavy duty types, the new design offers longer life under repeated stress and volume operations in the range from 500 to 800 lbs. pressures. The new bushings run full length through the clamp bars to provide more bearing surface and are hardened to resist wear. Instead of an ordinary press fit, the new bushing is serrated and locked in the clamp bars so that it will not turn and work loose.

The complete De-Sta-Co toggle clamp line offers over 45 models for pressures up to 4000 lbs.

He that never climbed never fell.



"We needed a glue that wouldn't be greatly affected by Gulf Coast weather conditions. We got it from Armour!"

Richard Dishinger, Plant Production Mgr.
Myers-Spalti Mfg. Co., Houston, Texas

"Temperatures and humidity conditions vary greatly and rather suddenly here along the Gulf Coast. In our type of construction, and by using solid woods, the use of the correct glue is one of the most important factors, due to the many glued joints that are required in our case goods. This calls for an adhesive that is not greatly affected by these varied conditions. We have found that Armour 'B B' hide glue is superior in every respect."

Armour "B B" hide glue is specified by Myers-Spalti for their complete line. They know they can depend on the unfailing high quality of this time-tested glue—and on the strong joints it produces (shear strength up to 3500 lbs. per square inch). "B B" has a wide working range, because it is less critically affected by such variables as temperature and humidity. And "B B" hide glue is unvarying in quality, from batch to batch, assuring a uniform operation.

Armour "B B" hide glue is only one of a complete line of Armour woodworking adhesives, including polyvinyl resin emulsions. Get in touch with Armour today for current prices.

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CC60—These Cover-All® cup goggles can be worn comfortably over normal size prescription glasses. Large perforated ventilation ports and ventilated external, metallic lens retaining rings reduce fogging to a minimum. Two-piece head-band and leather-curtained nose bridge are adjustable for wearer comfort.

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WOODEN SHIPS

That the U.S. Navy is building improved wooden ships for its minesweeper fleet will be great good news for many a father and mother whose son is still serving in Korean waters.

Bluejackets assigned to mine sweepers represent but 2% of the Navy's personnel yet they suffered 20% of the Navy's casualties in the Korean operations.

These new wooden ships are more immune to those magnetic mines which have taken a heavy toll of the Navy men on the mine sweepers now in use in waters around Korea.

These ships of the new AMS class, numbering 95, measure 144 feet from stem to stern. Their lightweight and sturdy construction are due in part to the magnetic-resistant aluminum faced plywood known as Armorply.

The United States Plywood Corporation, producers of this new laminate, combine .064 aluminum and ¾" and 1" plywood to provide decking, bulkheads and engine foundations.

Using SHAPERS and Avoiding Accidents

By Martin H. Saltz

ALTHOUGH the shaper is one of the more hazardous woodworking machines, it lends itself to certain accident prevention techniques that will minimize the number of injuries occuring. Accidents on this machine could be avoided as long as the stock being worked is kept between the cutter and the operator's hands. This necessitates the avoidance of the stock kicking out of place or breaking and also manual handling of small pieces of wood.

Several precautions concerning the use of shapers which would include the aforementioned concepts are as follows:

1. Keep the operator's hands away from the cutters by using fixtures, jigs, patterns, etc., so that during the movement of the stock across the cutters his hands are in a safe position.

2. Enclosing the cutting head so that in the event of the operator's hands accidently getting into the danger zone around the cutter, as much as possible of the cutter is covered.

3. Provide holddowns, guides, etc., to aid the operator in maintaining the stock in position as he passes it across the cutter.

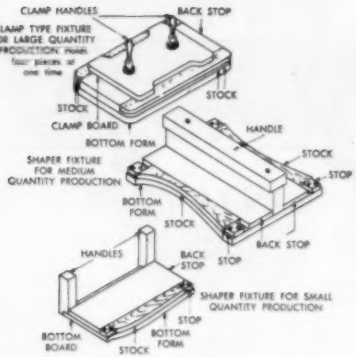
4. Maintain good floor conditions to prevent trips or slips which might result in the operator's losing his footing and being thrown into the danger zone.

5. Provide sufficient lighting so that the operator can see what he is doing.

In the following paragraphs, each of the items necessary in order to apply this set of rules will be discussed in some detail.

Shaper Guides:

The simplest guide is a ring or crescent held in position above and around the cutterhead. This is intended to prevent the operator's hands from coming into contact with the cutter. This type of guard is usually designed and adjusted to give a slight clamping effect to the stock and therefore offers some resistance to the operator in holding his



work. In some cases, the ring is enlarged into a cage in order to afford more protection to the operator.

Unfortunately, because of the variety of operations performed on a shaper there is no uniformly used guard. Each type of operation must be considered as an individual problem with a special guard provided.

Guides, Collars, Rings and Fences:

In addition to the use of spacers and filling rings to regulate the height of the cutters above the tables, the depth of the cut can be regulated by the use of a spacer guide or fence. This method is only applicable on straight pieces of stock. In the use of the fence, the opening for the blades should be kept to an absolute minimum and the fence should stand far enough behind the spindle to ensure good support for making the cut. If the entire edge of the stock is being cut away, it becomes necessary to use a split adjustable fence. In this case one portion of the fence is adjusted for the stock before the cut, and that portion behind the spindle is adjusted for the thinner stock.

When a pattern is used to hold the work, the depth of the cut is gen-

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erally controlled by the edge of the pattern bearing on the collar or ring. A hazardous condition that sometimes develops is one where the edge used for guiding the work splinters or breaks. In such a case, the need for a jig is indicated. A jig will not prevent breakage, but will eliminate the hazard to the operator in the event of breakage.

Patterns:

When using patterns the stock is set on top of the pattern and held in place with points. The patterns serve as a guide for the depth of the cut by contacting the guide collar. When patterns are used in practice, some of the work can be saved by rough cutting the piece to the approximate shape and then doing the finishing on the shaper. This is sometimes difficult to do on a single pattern and, therefore, in order to incorporate the safety feature other methods must be used. An example in which this problem exists would be a small piece in which the entire edge is to be shaped. In such a case a jig or fixture will provide more safety than hand-holding the job. Also, a double pattern may be used with the work sandwiched between the top and bottom pattern; here the pattern may be pressed on top of the work and provided with handles or grips.

Jigs and Fixtures:

Jigs and fixtures are used in order to increase both safety and production. Although general purpose jigs are available, it is better policy to design the jigs for each specific job.

Primarily, jigs are desirable because they provide a good grip for the operator with a resulting increase in safety. The grips should be kept as far as possible from the cutters. In many cases, jigs can be designed so that more than one piece can be processed at a time. A typical jig is illustrated in Fig I. Fix-

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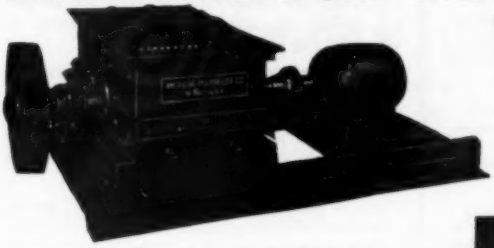

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tures are devised to assist in holding the material in position during the operation. The purpose is to prevent the material from kicking away from the cutters. It is important to realize that the material can kick away both horizontally and vertically. In order to prevent this kick back, non-kick back combs can be used. In order to ensure safe operating procedures, the following rules are recommended:

1. When one blade is removed from a shaper spindle for sharpening or some other process, all of the blades should be removed at the same time. This is to prevent other blades from being hurled from the spindle in case the machine is started accidentally.

2. When a table guide is used, the operator should be sure that it is well fastened and will not slip.

3. Only sharp knives of the same bevel and balance, free of burrs and other imperfections, should be used.

4. Short knives should not be used. They are dangerous because the shaper collars do not get enough bearing to hold the knives accurately.

5. Before tightening the knives in place, the operator should make sure the collar surfaces are free of burrs or foreign material which will prevent the knives from having an adequate balance.

6. Operators should not "back" up on a cut. Running material in the direction of rotation of the spindle instead of against it is dangerous.

7. Operators should avoid taking deep cuts or feeding the stock too rapidly.

8. Operators should be particularly careful in matching wood that contains cross grains or knots as they may cause the hands to be drawn into the knives or cause kick-backs.

9. Operators should not rest their hands near the edge of the material being cut.

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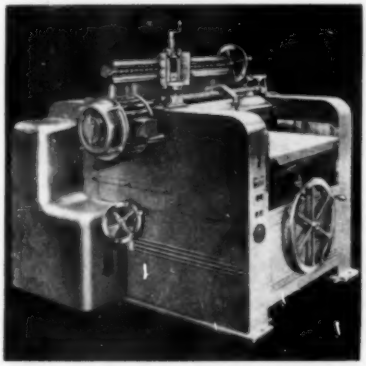
BUSS PLANER

This machine, manufactured by the Buss Machine Works, Holland, Mich., was designed to fill the gap between the small, light screw bed planers on the market and the heavy duty industrial planers. It is particularly suited for shops having medium production and yet requiring a fine quality grade of planing.



The machine has built into it all the features and adjustments of larger and heavier equipment. Of special interest is the one-piece grinding and jointing rail. This very strongly ribbed casting allows the machine to be ground and jointed to precision accuracy for fine knife work. Also, the machine is provided with one-shot oil lubrication whereby all moving parts in the machine are oiled except the cutterhead ball bearings.

Perhaps the two most important features of this machine are the simultaneous micrometer control for the lower rolls and the micrometer central control for the back pressure bar. The lower roll control enables the operator to change his roll settings from finish to rough planing by a turn of the hand dial. The rolls, of course, must be carried quite high during rough planing so that the twisted and warped stock will not jam in the machine. On the other hand, when the stock has to be run to finish cabinet smoothness, the rolls must be carried just a few thousandths above the center table so as to do accurate and smooth work. Without the use of this special control the operator oftentimes compromises his setting so the lower rolls are adjusted too low for roughing work and too high for finishing work. As a result the planer does not do a fine job for either operation.

The pressure bar control is a cam actuated control which maintains parallelism of the bar as it is re-set due to grinding of the knives or different conditions of stock. If the bar is not maintained parallel and in the correct position the stock will dip and the work

will not be of a satisfactory finish. These two controls have been called by many the greatest improvements in planers in 30 years.

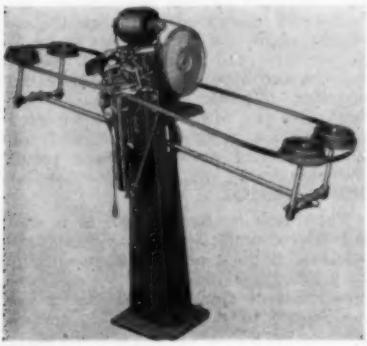
This machine also has variable feed for different production requirements. The machine is strongly constructed, having heavy drawn castings rigidly bolted together by tie-in grits and cross frames. It is completely ball and roller bearing throughout and has the modern motor on the arbor construction.

The machine is available in 24", 26" and 30" widths. Horsepower can be furnished up to 15 and the feed motor can be had in either 2 h.p. speed giving rates of feed 30 and 45 feet per minute or a 2 h.p. variable feed unit giving rates of feed 22 to 66 feet per minute.

SAW FILER

The Foley "Model 61" saw filer automatically files band saws, hand saws and cross-cut circular saws. It will sharpen ⅛" to 4½" wide band saws to 24 ft. in lengths with 3 to 16 tooth points per inch. Hand saws of 4 to 16 teeth per inch are accommodated. It will handle 3" to 16" circular saws with 3 or more points per inch with blade holes of from ½" to 1⅞".

The filer, manufactured by the Foley Manufacturing Co., Minneapolis 2, Minn., has the exclusive feature of a jointing action obtained by feeding the saw from the tooth just filed, bringing all teeth to a uniform size, height and spacing.



DIEHL No. 725

Known throughout the industry—in the production lines of furniture, millwork, and other woodworking plants—the Diehl No. 725 automatic air-operated cutoff saw is one of the best-constructed,

most compact ram-type saws on the market. It is manufactured by the G. M. Diehl Machine Works, Wabash, Ind.

Here is a cutoff saw designed for continuous use—day after day—for stock in thicknesses up to 5" and widths up to 22" on 1" stock. Operated by an air cylinder mounted on the carriage, the ram of the No. 725 is lined up with the straight line motion of the ball races. As each stroke cycle is completed, the ram return is cushioned by an adjustable needle valve, assuring longer wear-life and more consistent accuracy. The ram moves on hardened-steel ball bearings, and runs in hardened and ground races.

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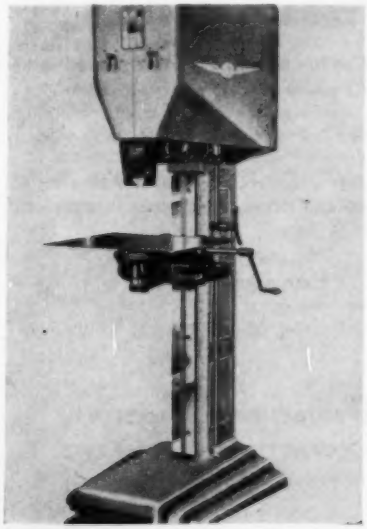
With a maximum of 55 short strokes per minute, the Diehl No. 725 operates at 3,600 r.p.m. Length of stroke is 23". Controls are easily accessible on the No. 725, and either right or left hand operation is available.

NAILING MACHINE

The Auto-Nailer is manufactured by the Auto-Nailer Co., Atlanta, Ga. It is a tough, expertly made precision machine that in one motion cuts and drives its own nails from a coil of knurled nailing wire. Step on a foot pedal and "bing," the nail is driven. Hold the pedal down and it cuts and drives at the rate of three nails a second—clinching, or bradding as it goes and driving either flush or countersunk. Twist a small convenient knob and the nail can be made the exact length needed for the job at hand.

Here are the salient points about the Auto-Nailer. It can be used on all types of wood, light metal and plastic nailing. Can reduce labor up to 75%. By automatic pressure effecting friction between the skid members, it nails more rigidly and reduces racking. Very flexible, can change from one size (or design) skid to another without adjustment. No jigs necessary, will pattern-nail as fast as you can feed it (but takes jigs easily if work requires). Will space nails so accurately you can print your name with it. Permits greater use of scrap or irregular stock and nails easily through knots. Nails won't back out, specially knurled nailing wire holds firmly.



DOVETAILER NO. 600

Wysong & Miles Co., Greensboro, N.C. offers a number of dovetailing machines to the woodworking industry. Here is model No. 600. This machine makes possible the dovetailing of both drawer

sides in one fast operation. The variable feed permits rate of operation best suited to the individual operator and the particular job involved. Speed may be stepped up to as many as 25 strokes per minute.

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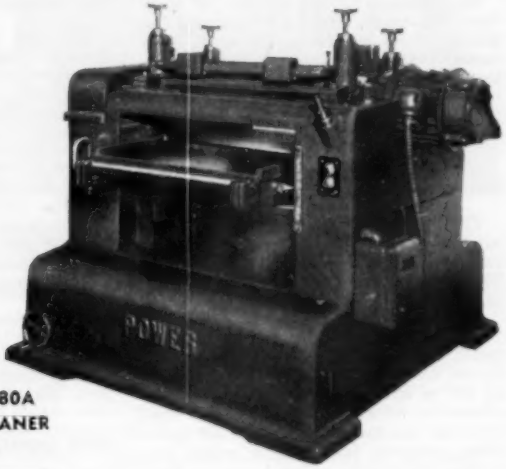

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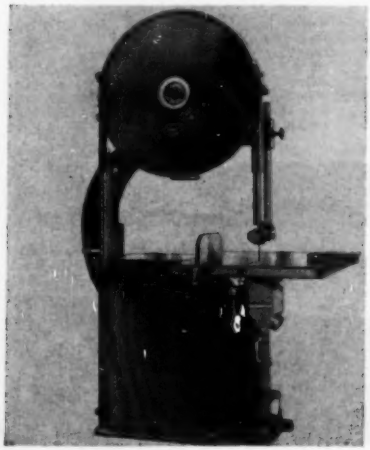
MOAK BAND SAW

This standard high speed 36" band saw offers speed and an unusually large range, handling stock up to 20½" high. The machine is manufactured by Moak Machine & Tool Co., Port Huron, Mich.

These saws have 36" wheels, 35½" capacity between the blade and frame. Carter disc wheels, choice of three types of drives and two types of brakes, are offered in all models. Some of the features of this machine include: all operating controls for making every required adjustment without moving from position in front of machine; constructed to operate with an absolute minimum of vibration; a tracking gauge located in the upper wheel guard; and lubrication for life.



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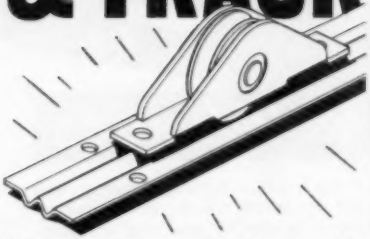

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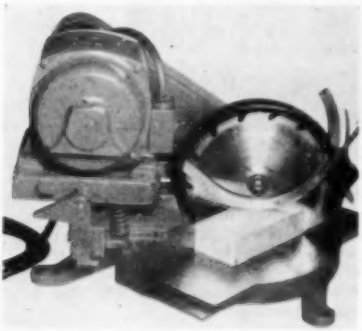
ELECTRIC MITER SAW

The type M electric miter saw for bench use is manufactured by the Tannewitz Works, Grand Rapids 2, Mich. This machine is available in two sizes, namely with ½ h.p. or 1 h.p. motor and 10" diameter saw blade, and with 2 h.p. or 5 h.p. motors and with 14" diameter saw blade.

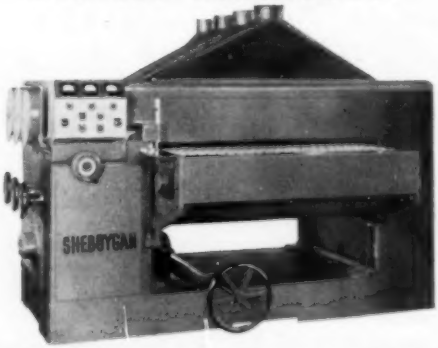


The smallest size machine will miter a 2 x 4 whereas the larger machine will miter a 2 x 6. The larger machine will cut off square as wide as 12" x 1", whereas the smaller machine cuts off only as large as 6" x 1".

The idea of this machine is that it is available for bench use and will quickly swing and cut any angle 45° left to 45° right. The table is graduated accurately in degrees with clamp for any position. The saw guard is unique and absolutely protects except when the operator is making a cut.

SHEBOYGAN

Endless Bed Sander



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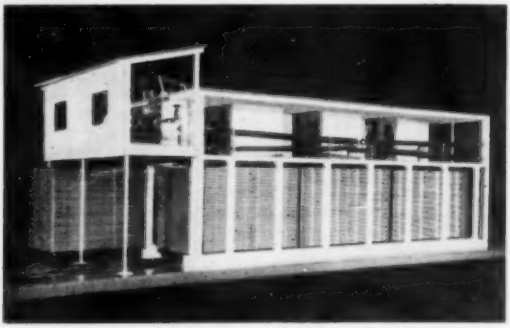
SHEBOYGAN **WISCONSIN**

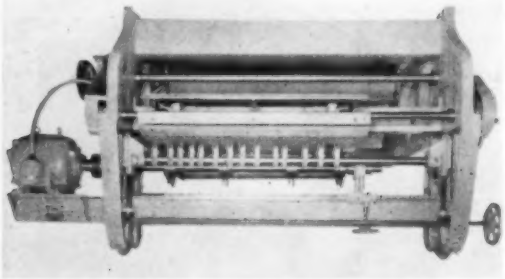
SCALE MODEL KILN



Here is a small operating scale model of the Moore reversible cross-circulation kiln, illustrating the principal advantages of the Moore drying system. Some of these advantages are: cne motor and drive operates entire fan system—motor, drive and all electric wiring are located outside kiln, protected against heat, humidity and wood acids; Moore special dry kiln fans deliver maximum volume of air at low power consumption, producing uniform circulaticn in all parts of the kiln; circulation is reversed automatically at desired intervals; Moore flexible fin pipe heating system is divided into two sections lengthwise the kiln for two-end control of temperature—designed to operate on high pressure live or low pressure exhaust steam; roof ventilators are automatically controlled by Moore master controller, which also controls and records drying elements at each end of the kiln independently.

This model Moore cross-circulation kiln was on exhibit at the Moore Dry Kiln Company booth at the recent Woodworkers' Industry Show at Grand Rapids. The Moore Dry Kiln Company is located in Jacksonville, Fla.

MULTIPLE CUTOFF SAW



This saw is manufactured by the Mereen-Johnson Machine Co., Minneapolis 12, Minn. The illustration shows the rear view of the firm's No. 435-H slat bed multiple cutoff saw. The view shows an arbor set up for multiple ripping and grooving of drawer fronts for furniture case goods. The machine

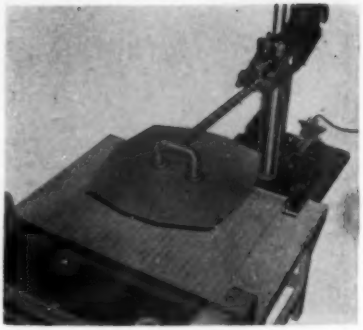
will rip and groove as many as eight drawer fronts at a time from a single glued up panel. The machine was on display at the Woodworkers' Industry Show at Grand Rapids, May 5-7.

AUTOMATIC VACUUM LIFT

The Union Tool Corporation, Warsaw, Indiana, demonstrated its newly designed automatic vacuum lift at the Woodworkers' Industry Show.

This new machine is designed to handle non-porous wood pieces up to 40" x 40" or larger. The unit can manipulate from one to six sheets per minute. It contains its own vacuum plant and may be hooked into any electric power and air line.

The machine will pick up at any level from floor to 36 inches high and is adjustable through this range. It is also adjustable through 180 degrees' turn so as to be able to lay the sheet exactly into position in any repetitive operation.



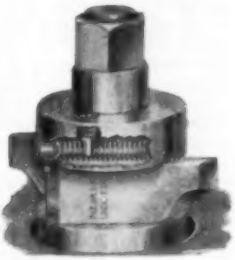
The per cycle air consumption is approximately .60 cubic feet. Pushbutton control can be put on a separate unit handy to the operator.

SAW ARBOR APPLICATION

This is a type SRP saw arbor installation as designed by a prominent mill-

SCHMIDT LOCK-EDGE
SAFETY SHAPER COLLARS

LOCK-EDGE SHAPER KNIVES
CANNOT FLY OUT OF
THESE COLLARS.
NOW A NEW SAFETY DEVELOPMENT.

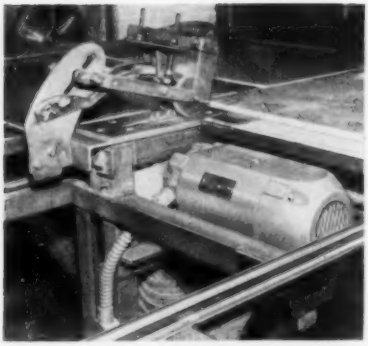


ULTRA ACCURATE GROUND SHAPER STEEL

THE LABEL BELOW SHOWN ON EACH BAR
GUARANTEES CONTINUOUS UNIFORMITY.

Shaper steel bars of this width, either plain or Lock-Edge, are ground to within .001" (one thousandth of an inch) in width; therefore a piece of any length left from this bar can be used with a piece from any other bar of this nominal width bearing this label.

CHARLES G. G. SCHMIDT & CO., INC.
403-405 Broome St. • New York 13, N. Y.



work and plastic manufacturing company. This saw arbor motor is manufactured by the Louis Allis Co., Milwaukee 7, Wis.

The machine is used for trimming and cutting large sheets of plastic laminate to the size required for ultimate consumption. The sheet of plastic rides on the roller mounted section of the table (right center) which moves forward over the top of the motor, carrying the sheet through the saw (center). The two rollers located on the table immediately ahead of the saw perform the dual function of a saw guard and also a mounting for the plastic shield which restricts the sawdust and protects the operator. The bulk of the sawdust follows through the saw cut and is carried away by the blower piping which can be seen beneath the table.

The motor is a 5 h.p., 3,600 r.p.m., frame 624 assembled with the flat side opposite the feet and with standard saw collars. The flat side on the motor allows the motor shaft to be closer to the work surface thus permitting the use of a smaller diameter saw. This is representative of some of the special problems encountered in the woodworking industry where the type SRP motor coupled with the ingenuity of the user has resulted in a very satisfactory solution to his production problem.

NEW-MATIC FACER

Baxter D. Whitney & Son, Inc., Winchendon, Mass., is offering the Whitney No. 600 New-matic facer to the woodworking industry. It is a heavy duty machine for the fast, efficient facing of

rough-cut lumber, glued-up panels and cores. It has revolutionary, new, endless rubber fabric feed belt with pneumatic rubber feed fingers for positive feeding of lumber without strain or distortion.

Upper feed works frame is rigidly supported on four large ball bearing

dependable HARDWOOD DIMENSION

- finished, semi-finished or rough
- lumber or parts
- solid or laminated
- corestocks, blocks
- wood-and-plastics
- Gam-en-wood

GAMBLE BROTHERS GB GUARANTEED BOND INCORPORATED

Engineered Wood Parts in Southern and Appalachian Hardwoods, Walnut, or Mahogany.

OFFICES AND PLANT: Louisville 9, Kentucky

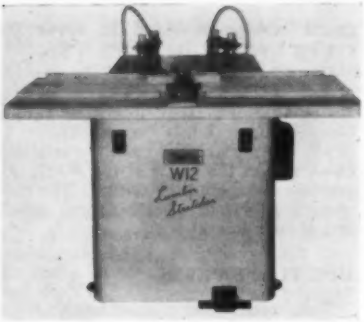
screws. Variable speed feed unit furnishes feeds up to 100 feet per minute. Centralized controls with convenient push-button operation. Unique mounting of cutterhead for greater ease and safety in setting and grinding the knives. The machine is built in 24" and 36" widths.

SCARFING MACHINE

Onsrud Machine Works, Inc., 3947 West Palmer Street, Chicago, Illinois, has designed and built a new and improved scarfing machine which produces perfectly matched joints and cuts both mating boards simultaneously. The new model makes it possible to perform a complete cutting cycle on two board ends in approximately 15 seconds, including loading, clamping, cutting, return and unload.

The new Onsrud W-12, known as the "Lumber Stretcher," is used to make long boards out of short boards and is designed with a stationary table which provides greater accuracy. The work is clamped securely to the table and the scarfing cutters pass through the material instead of the material moving through the cutters as was done on former models. Return movements of the cutters through the material completely cleans the cutter kerf, thereby eliminating the necessity for further preparation prior to the application of glue.

The "Lumber Stretcher" will scarf boards up to and including 2 inches thick and 12 inches wide. The motor



used is a 7½ h.p., 3,450 r.p.m., 60 cycles, 220/440 volts, 3 phase. A hydraulic system is used to feed the scarfing cutters through the work and for clamping work to the table. Dual push-button start and stop control insures complete safety to the operator. The machine will not operate unless both push buttons are applied simultaneously and the work is firmly clamped to the table. A

STOP DUST

DUSTKOPS — **20 Models**

UNIT TYPE — 300 to 3600 cfm
LOW COST — ¼ hp to 5 hp

AVAILABLE FROM STOCK

For: Grinders, buffers, polishers, woodworking, lint . . . All Dusts.

Send for Cat. 605a; describe problem.

AGET-DETROIT CO. · Ann Arbor, Mich.

"HARTFORD" CLAMPS

Style 6G: Deep engagement clamps. Quick acting. Take the place of "C" clamps. Speedily adjusted.

Double bar clamps. Prevent buckling. Especially adapted to thin work. 32 Clamp Styles Available. Write for free Catalog Today.

ABOVE: Style 3G: Deep engagement clamps. Quick acting. Take the place of "C" clamps. Speedily adjusted.

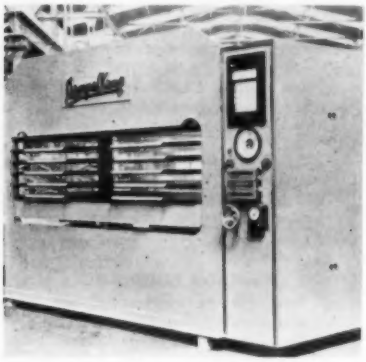
The HARTFORD CLAMP COMPANY EAST HARTFORD, CONN. Est. 1915

guard is also provided to cover the cutting area.

The "Lumber Stretcher" is capable of producing angular scarfs as well as straight joints. Lap joints and long tapered finger joints up to 2 inches in depth are possible and other variations come within the scope of the W-12, depending on the cutter design. The machine can also be used for some standard shaper operations.

HOT PLATE PRESS

This press, being offered by the Wilco Machine Works, Memphis 8, Tenn., does not require a special foundation and it is a comparatively lightweight unit designed for veneering, as done by furni-

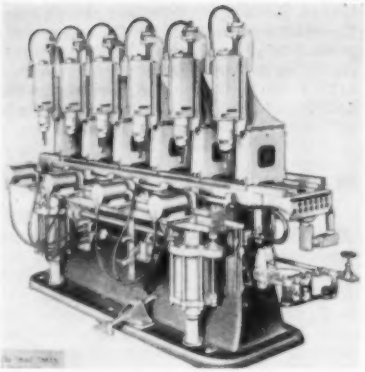


ture factories. The press has 5 openings; daylight inches, 2¾"; and requires 10 h.p.

In addition to the range of presses being offered, presses can be built to a customer's specifications as to platen size, number of platens, number and size of rams, pressure, daylight, etc.

MULTIPLE HEAD MORTISER

The Bell Machine Co., Oshkosh, Wis., is now offering the No. 80 multiple head mortiser with cushioned power feed. The working heads are in a vertical



position permitting more production because of the convenient waist-high position. Work piece and cutting tools are in full view all of the time. The machine can do a multiple chisel mortising operation, a multiple chain mortising operation or a multiple boring job—all together or separately.

The basic design of the machine combines vertically disposed heads with an air power feed table. Another advantage of the machine is the utilization of modern air power feed. The cushioning effect of air power permits momentary compensation to the feed rate when the cutting tools encounter occasional hard spots in the material. With cushioned power it is possible to change instantly the operating speed of the table with a twist of a valve.

Heads have full individual adjustments that are quickly and easily made.

TRIP GAUGE FEATURED ON HANGER BOLT DRIVER

A new 100 series Titan automatic self-opening hanger bolt driver featuring a patented collapsible type trip gage, has been announced by the Titan Tool Company, Main Street, Fairview (Erie County), Pa., manufacturers of Titan stud drivers, bushing drivers, collets, chucks and hanger bolt drivers.

According to the manufacturer, the new automatic self-opening hanger bolt drivers are designed for rugged use and eliminate marking of bolt threads. The hanger bolt drivers are also positive in drive and automatically grip and release the hanger bolt without screwing on or off the bolt—a fast operation, at any rate of r.p.m., timed in seconds.

Other important features of interest to users of hanger bolt drivers are: automatic take-up for wear on jaws; reversing position of clutch gives double wear at half cost; affords accurate projection heights; can be used with any air or electric drill or drill press.

FLUSH AND FINGER PULLS

Grant Pulley & Hardware Corporation, 31-85 Whitestone Parkway, Flushing, New York, announces the current availability of a new and distinctive type of flush and finger pulls designed to be used with every type of sliding door or panel.

The manufacturer states: "flush pulls come in four types: rectangular, oval, round and finger pulls. Rectangular and oval pulls are applicable as flush lifts for double-hung windows."

All pulls are available in the following material and finishes: brass, polished and lacquered; brass, bright chrome; brass, dull chrome; and aluminum, bright etched.

Finger pulls are available in: brass, bright chrome; brass, nickel plated; aluminum, bright etched; and aluminum, brass plated.

FASTENER CATALOG

A new promotional piece on Octopus fasteners is currently being offered to the furniture and woodworking industry.

The patented Octopus fastener is a rigid, blind fastener for K-D furniture and woodworking. It consists of a Tee nut and a sleeve. The sleeve is slipped over the Tee nut, then both are pressed into a bored or drilled hole with a simple setting tool. The sleeve prongs then spread outward into the wood and anchor the Tee nut securely. Result is steel threads in wood.

The use of the fastener reduces shipping and storage costs; eliminates breakage in transit; cuts assembly line and packaging costs; permits dealer or home assembly without tools and can be assembled or disassembled as often as needed.

The illustrated folder is available from Dept. DB, United-Carr Fastener Corporation, Cambridge 42, Mass.

"TELL OLIVER I'M PAYING HIM TO SAW PLYWOOD — NOT LOGS!"

to up-to-date information

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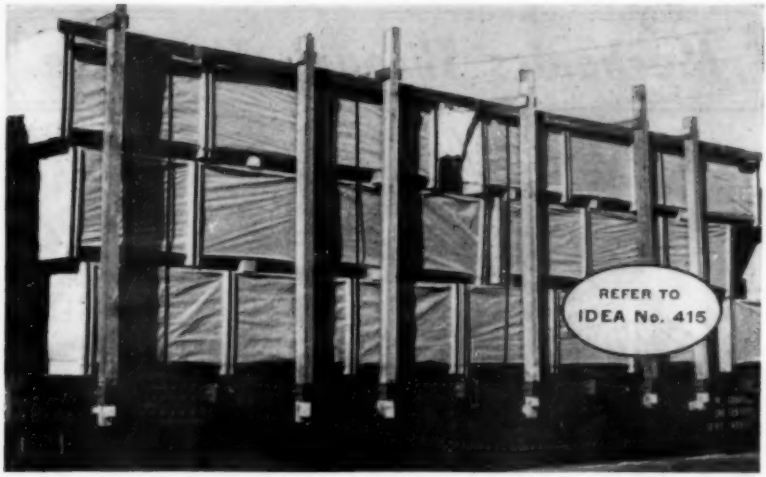
Woodworkers' Tool Works, page 115, Catalog.



AIM* for SAFE SHIPMENT of Wood Products with Acme Steel Strapping Ideas

Acme Idea Man, Richard F. Brennan of Seattle, helped solve this shipping problem.

ask your *Acme Idea Man to help solve your problems

Piece-by-piece handling has been eliminated at Brooks Lumber Company, Bellingham, Wash., by palletizing wood products with Acme Steel Strapping. Idea No. 415 is typical. More than a million feet of 2½" x 4" pipeline staves were delivered in Alaska undamaged and immediately ready for installation. The carefully prepared staves were assembled into bundles... protected with paper... then bound securely with Acme Steel Strapping.

Ask your Acme Idea Man to analyze your shipping and packaging operations. Or, write Acme Steel Products Division, Dept. CX-65, 2840 Archer Avenue, Chicago 8, Illinois.

AIM *for Safe, Lower-Cost Shipping*

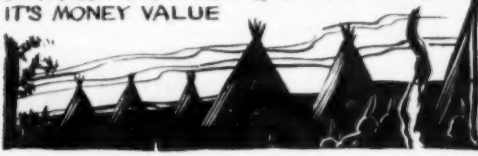
ACME STEEL

Mechanics Through The Ages

THE TIRE FLANGES OF THE DRIVING WHEELS USED ON MID-1800 LOCOMOTIVES WERE SHAPED WITH HAND TOOLS! USUALLY, TAPER FITS OF PISTON RODS WERE MADE WITH HAND TOOLS TOO.

Al Reetz

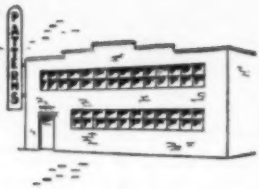
IN EARLY COLONIAL DAYS, A MAN WORKING STEADILY COULD PRODUCE ABOUT 15¢ WORTH OF WAMPUM A DAY. WAMPUM CONSISTED OF TINY CYLINDERS, EACH OF WHICH HAD TO BE LABORIOUSLY POLISHED ON STONE .... THEN BORED BY MEANS OF AN AWL-TIPPED CANE WHICH THE INDIAN TWIRLED WITH HIS RIGHT HAND AGAINST HIS RIGHT THIGH WHILE HOLDING THE SHELL IN HIS LEFT HAND. DIFFICULTY OF MASS PRODUCTION GAVE THE WAMPUM IT'S MONEY VALUE

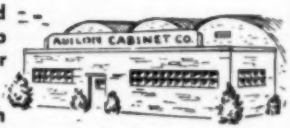


A MEDIAEVAL WORKMAN OR HIS MASTER WHO TRIED TO PALM OFF SPURIOUS WORK FOR A FIRST CLASS JOB WAS LIKELY TO HAVE AN EAR OR HAND LOPPED OFF.

Good News Gets Around...

Moak Hand Planers and Jointers



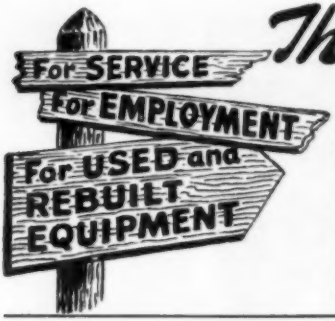


FOR FAST-FEED, VIBRATIONLESS PRODUCTION ON DOZENS OF SHOP JOBS

You get more for your money in Moak Hand Planers and Jointers, the indispensable shop tool for jointing, planing out of wind; for chamfering, rabbeting and beveling.

Tungsten steel knives are fitted in the high carbon alloy steel cylinder head, the head mounted in self-aligning ball bearings enclosed in dust-proof housings. Available in sizes for planing 12″ and 16″ lumber; equipped with ½″ rabbeting groove, adjustable bevel gauge and hand brake for safety.

Get the facts **on Moak Hand Planers and Jointers right away. Write for our illustrated descriptive and specification folder.**



The Market Place

Rates for Classified Advertisements

Lists of Used and Rebuilt Machinery, either For Sale, Wanted, or For Exchange, set in uniform style, will be published in the Classified Section at the rate of $7.50 for name and address and a five line advertisement. For additional lines, only 75c per line.

DISPLAY ADVERTISEMENTS: 1 inch (Minimum), $8.50; 2 inches, $17.00; 3 inches (Maximum), $25.00.

Write directly to those offering the machine for sale, for prices and full descriptions. If what you **seek** is not advertised, write Hitchcock Publishing Company, 222 E. Willow Ave., Wheaton, Ill. making known your wants on either new or used machinery and the publisher will gladly assist you.

FOR SALE

S. W. Harrington, Inc.

P.O. Box 230 **Asheville, N. C.**

Air Compressors, various sizes
Bandsaw, American 38", bb. v-drive
Band Saw, New Delta 20" bb. dmd.
Band Saw, New Moak 36" b.b. d.m.d.
Blowers, Sturtevant No. 70 & 55"
Borers, Greenlee 369-4 ft. M.D.
Borers, Greenlee No. 370 6 ft. horiz. dmd.
Borers, Moak 88 2 Spdle. horiz. dmd.
Borer, W&M No. 283B Single Spindle Vertical, dmd.
Boring & Sawing, McKnight 26F dmd.
Clippers, Sheridan 65" dmd.
Clippers, Coe 85" bd. & motor
Dovetailers, Dodds, 10 & 20 spindle
Frequency changers, 30 KW dmd. and 15 KW.
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Jointers, Glue, Yates-American No. 213 bb. dmd.
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Lathe, Yates No. 74 bb. dmd.
Lathes, Mattison 55C and 57D
Lathe Heads, Mattison Hex. T-slot
Mortiser, Sidney, single spindle pb. bd.
Mortiser, Greenlee No. 228 Vert. bd. & motor
Mortiser, New Britain No. 7, bd. & motor
Mortiser, W&M No. 288—5 spdle. Horiz. dmd.
Moulder, Amer. No. 35—9" bb. dmd.
Moulders, Hermance 7" pb. bd.
Moulders, Mattison No. 222, 6" bb. dmd.
Moulders, Woods No. 107—12" pb. bd.
Moulders, Yates-American C-4—8" bb. & motor
Moulders, Yates-American C-89—6" bb. dmd.
Planer, Facing, Yates-Amer. 38" with Jackson & Church feeder on base, bb. dmd.
Planer, Whitney 30" Sgl. rd. hd., b.b., d.m.d.
Planer, Whitney 36" Sgl. rd. hd., b.b., d.m.d.
Planers, F&E—30" dbl. pb. bd. & motors
Planers, Berlin 36", rd. hd., dmd.
Planers, New Crescent 24" bb. dmd.
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Routers, Defiance sgl. spdle. high speed, dmd.
Sander, New Jefferson, hand block, bb. dmd.
Sanders, Mattison No. 134, pb. bd.
Sanders, Niagara Brush, bb. dmd.
Sander, 48" double disc, dmd.
Sander, Smith 49" 3-drum endless bed, bd.
Sanders, F&E 60" 3 drum roll feed, dmd.
Sanders, McKnight sgl. drum 24"x16" dmd.
Sander, Oakley Model G2, bb. dmd. bd. block
Sander, Porter Cable vert. osc. dmd. sgl. spdle.
Sander, W&M No. 171 belt, b.b., m.d.
Sander, Yates No. 431, 43" endless bed, dmd.
Saw, Beach 6 ft. dbl. cutoff & motor
Saws, DeWalt, 7½ hp, radial
Saws, Hermance Gang Rip, pb. & motor
Saws, Jenkins 105A dbl. cutoff bb. dmd.
Saws, New Delta-Crescent 12" tilt. arbor, dmd.
Saws, New Multiplex, 40A & 50A
Saws, Skilsaw, 2 hp. sgl. pb. radial
Shaper, Defiance dbl. spdle., bb. dmd.
Shaper, Whitney No. 389, dbl. bb. dmd.
Shapers, New Moak single spindle, bb. dmd.
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Shaper, Whitney double spindle, bb. md.
Sticker, American No. 1, 1 side 4" pb. bd.
Taping machines, Dennis No. 2
Tenoners, Yates Amer. No. 55 Sgl. end, bb. dmd.
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American No. 80 15" double, heavy duty

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Ekstrom-Carlson No. 126, B.B., M.D.

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Porter No. 103 single, ball bearing, M.D.
Onsrud WA-50 Automatic, motor driven
Whitney No. 165 S.S. motor on arbor
Onsrud No. W-248 single spindle, high speed
Whitney No. 282 single D.M.D., 36"x40" table
Greenlee No. 180, double spindle, D.M.D.

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Moak 16A Tilt table D.M.D.
Whitney No. 61, tilting arbor, D.M.D. B.B.

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Sidney No. 720 Straight Line, motor on arbor
Oliver No. 94-D Straight Line, motor on arbor
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DeWalt GE 5 H.P. motor
Multiplex No. B-60 radial arm, 7½ H.P. motor

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Sheboygan 49" 3-Drum Endless Bed, B.B.
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Lancaster Air Operated End Clamp
Five High Frequency Lumber Edge Gluer
40 Section Taylor Power Operated Clamp Carrier
New Air Operated Frame and Chair Clamps
Taylor Panel-Flo Edge Gluer

DOVETAILERS

12 Spindle Dodds with auto. feed for sides only
Five Automatic Double End Dovetailer
Wysong & Miles No. 293 Auto. Dovetailing Mach.
Wysong & Miles No. 601 Front & Back Machine

GLUE SPREADERS

64" Union Dble. Rubber Roll Resin Glue Spreader

GRINDERS

Covel-Hanchett Band Saw Grinder
Practically New Stetson-Ross No. 872 Grinder
Woods No. 229M motor driven jointing stand.

JOINTERS

Diehl No. 660 Glue Jointer, Direct Motor Drive
Yates-American No. 213 Direct Motor Driven Glue Jointer
24" Yates-American No. 1 Jointer

LATHES

Yates-American 42" No. 74, mtr. dr., ball bearing
Yates-American 30" T-5, motor driven, ball bearing
Mattison 42" No. 57-D motor drive ball bearing
Mattison 30" No. 55-C motor drive, ball bearing

MATCHERS

Woods 412M electric planer & matcher
Woods 501M Direct Motor Drive, Ball Bearing Hardwood Flooring Machine
Woods 503M Electric Planer & Matcher with double profile and automatic feed table
American No. 33 End Matchers
Yates A-1 Planer & Matcher

MORTISERS

Wysong & Miles No. 284 direct motor drive, ball bearing single spindle mortiser
Wysong & Miles No. 288 direct motor driven 4-spindle mortiser
Wysong & Miles No. 286 Hinge Seat Mortiser
Wysong & Miles 6-Spindle No. 268 Mortiser

MOULDERS

Yates-American 6" No. C-75 electric moulder
Newman 12" No. 412 Electric Moulder
Woods 808M 4" Electric Moulder
Yates-American 4" Type C-88 Electric Moulder
Newman 6" No. 46 Electric Moulder
Newman 12" No. 27 Ball Bearing Belt Driven
American 9" No. 35 Electric Moulder
Practically New Stetson-Ross 8" Type 48-K Fast Feed Electric Moulder, with hopper feed
Hayes Sash & Door Sticker w/Plowing & Boring
Mattison 6" No. 276 Electric Moulder

SINGLE PLANERS

Buss 40" direct motor drive, ball bearing
Whitney 30" No. 32 Direct Motor Driven Ball Bearing Planer
Yates-American 30" No. 1 Jointer with Herzog Feeder

DOUBLE PLANERS

Buss 36" Double Planer
Yates-American 30" No. 177 ball bearing, direct motor driven with electric grinder
Whitney 30" and 36" No. 24 direct motor driven ball bearing, with grinder and jointer

SANDERS

Mattison No. 124 Automatic Stroke Sander
Pearson Waterfall Sander
Oakley Model H Drawer Sander
Nash No. 50 and No. 25 Turning Sander

BAND SAWS

Yates-American 36" Type Y-36 motor drive, bb.
36" Yates-American Motor Driven Ball Bearing Band Saw
Yates-American Type V-54 Roller Brg. Band Resaw
Berlin 44" No. 283 Band Resaw

CUT-OFF SAWS

Beach No. 3 Roller table double cut-off saw
Bell No. 24-B Double End Sawing, Boring and Chucking Machine
Fay & Egan No. 501-A Direct Motor Driven Ball Bearing Swing Saw
Eaglesfield Direct Motor Driven Ball Bearing Swing Saw
Jenkins 105A Electric Double Cut-Off Saw

RIP SAWS

Eaglesfield Direct Mtr. Dr. Ball Brg. Rip Saw
New Marion Glue Joint Rip Saw, in stock here
Mattison No. 287 Direct Motor Driven Ball Bearing Glue Joint Rip Saw
American No. 15 Ball Bearing Chain Feed Rip Saw
Yates-American G-67 Chain Feed Rip Saw

ROUTERS

Yates-American U-9 Electric Router

SHAPERS

Whitney No. 251 Double Spindle Electric Shaper
Whitney No. 234 Double Spindle Electric Shaper
Whitney No. 295 Double Spindle Automatic Shaper
Onsrud W-125 Double Spindle Automatic Shaper
Onsrud W-125 Single Spindle Automatic Shaper

TENONERS

Yates-American No. 3½ Electric Tenoner
Jenkins No. 95 Electric, double-end
Yates-American No. 55 direct motor drive heavy duty single end tenoner

VENEER MACHINERY

Merritt 12 plate 86"x54" redrier
Francis 76" Hydraulic Veneer Clipper
Dennis Veneer Taping Machine, Motor Driven
Francis 84x36" hydraulic veneer press, M.D., with booster pump and overhead crane
Stempelkamp Hot Plate Press
Merritt 13 Plate redrier 60 by 38

MISCELLANEOUS

Salstrom 18-spindle Carver
Ekstrom-Carlson late mod. M D, HB bedlock mach.
Wardwell Saw Filer
Master 24 Spindle Motor Driven Carving Machine
Morgan 7-track open back nailer with clincher
Williams Motor Driven No Knife Hog
New Raimann Automatic Knot hole borer & plugger
Leitelt Lumber Lift

Sutton WOODWORKING MACHINE CO.

PHONE 2-4186 **SEDGEFIELD INN** **GREENSBORO, N. C.**

PRODUCTS INDEX

Compiled for quick reference and for your convenience, this handy index of products shows the pages on which you will find the items advertised in this issue. When writing to advertisers, it will be appreciated if you will mention WOOD WORKING DIGEST.

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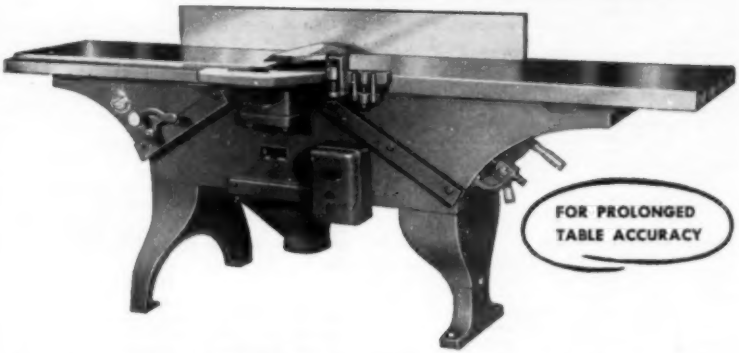
FOR LONG LASTING
HEAVY DUTY ACCURACY

NORTHFIELD

12 and 16 INCH
HEAVY DUTY
HAND JOINTER



FOR PROLONGED
TABLE ACCURACY

THE NORTHFIELD Heavy Duty Hand Jointer is intended for production work where accuracy and fine quality are essential. The legs are placed so as not to obstruct the feet of the operator. Weight is well distributed for balance and smooth running. Tables are of box form construction, cored the full length, machined and hand scraped for accuracy.

The NORTHFIELD Guarantee

We guarantee perfect satisfaction to anyone who may purchase our machines, and if any reasonable exceptions are taken to their good performance, they may be returned at our expense.

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HIGH SPEED, PRECISION

- Band Saws
- Surfacers
- Wood Shapers
- Jointers
- Saw Tables
- Mortisers (Chain & Hollow Chisel)
- Universal Woodworkers

Northfield FOUNDRY & MACHINE CO.

★ ★ ★ NORTHFIELD, MINNESOTA, U. S. A.

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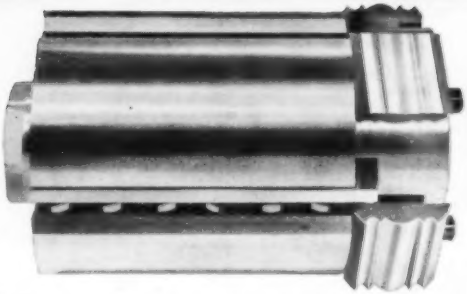
BADGER

CUTS CUTTER COSTS FOR PICKWICK PANELING

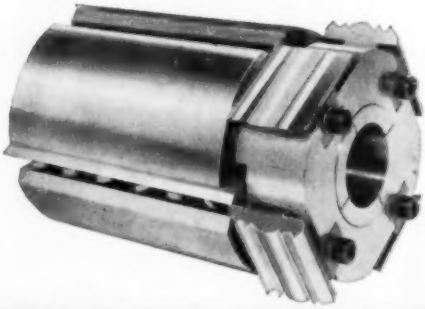
FORMER COSTLY, NEARLY IMPOSSIBLE OPERATION MADE SIMPLE BY BADGER



Economical production of all widths of any kind of paneling on a moulder has been a near impossibility unless a very costly and very wide milled-to-pattern head was used. Cutter cost reduction, however, was accomplished by the design of the combination head unit illustrated. This head assembly consists of a Badger Round Head with thin high speed steel knives combined with a Clamp "T" Slot Head with milled-to-pattern bits. Both heads are mounted on a single self-centering sleeve as a unit. Recesses in the Clamp "T" Slot Head permit the extension of the knives of the Round Head to produce a smooth, clean cut where the Pickwick Pattern and the straight part of the panel meet. All Widths of paneling can be made by merely adjusting the side head to the desired dimension.

By separating the surfacing from the pattern cutters, not only is there a substantial reduction in cutter costs, but sharpening, jointing, and set-up time is shortened considerably. Thus overall maintenance expense is minimized.

Badger engineers have designed the two-headed interlocking unit so that both heads can be used separately on individual sleeves. "Cutting cutter costs" is not only accomplished but the individual heads also become available for other jobs—a Round Head for straight surfacing work and a Clamp "T" Slot Head that can be used for other milled-to-pattern jobs. Badger helps you engineer your cutters and heads for maximum operating flexibility and economy.



WISCONSIN KNIFE WORKS BELOIT, WISCONSIN

Engineers to the Woodworking Industry

world's
largest
maker
of **hardwood floors**

selects

KIRK AND BLUM
dust control

"Our feeling was that you could give us better engineering and workmanship . . . we were not disappointed."

E. L. BRUCE CO., Memphis, Tennessee

E. L. Bruce Company, the world's largest manufacturer of hardwood floors, selected KIRK & BLUM to revamp and modernize their dust control system.

In the Bruce plant, Kirk & Blum engineers provided a flexibility and efficiency in operation never before attained. "Unitized" systems permit operation of any line or combination of lines, independent of the others.

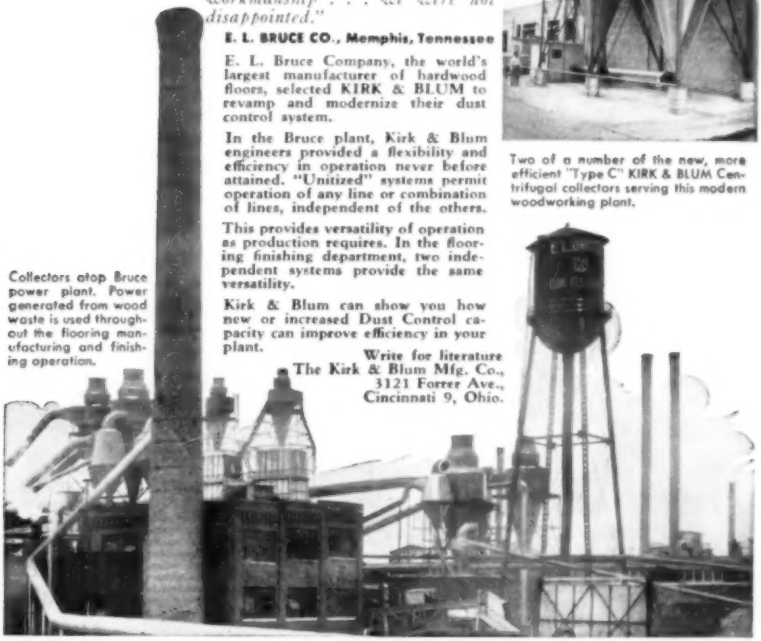
This provides versatility of operation as production requires. In the flooring finishing department, two independent systems provide the same versatility.

Kirk & Blum can show you how new or increased Dust Control capacity can improve efficiency in your plant.

Write for literature

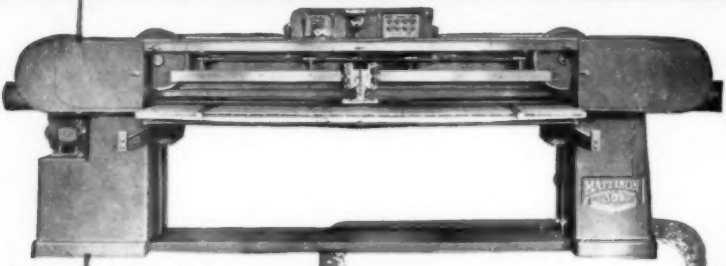
The Kirk & Blum Mfg. Co.,
3121 Forrer Ave.,
Cincinnati 9, Ohio.

Two of a number of the new, more efficient "Type C" KIRK & BLUM Centrifugal collectors serving this modern woodworking plant.



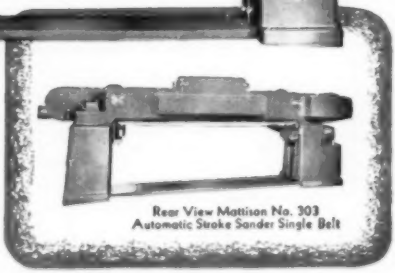
Collectors atop Bruce power plant. Power generated from wood waste is used throughout the flooring manufacturing and finishing operation.

MATTISON'S NEW
No. 303 Automatic STROKE SANDER



Front View Mattison No. 303
Automatic Stroke Sander — Single Belt

Mattison No. 303
Automatic Stroke Sander — Double Belt



Rear View Mattison No. 303
Automatic Stroke Sander Single Belt

● The Mattison No. 303 Automatic Stroke Sander is the last word in modern engineering. From the standpoint of design — construction — smoothness of operation and appearance, it is in a class by itself. Results that can be expected are faster output, better quality of work, and trouble free operation. These important features are all to your advantage. Hydraulic system for operation of shoe is simple yet positive in action, providing smooth operation of sanding shoe the entire length of stroke. Belt speeds to meet your needs. All controls are within easy reach of operator. The sand belt is completely enclosed at top and both ends for dust control and safety. Belts are easily and quickly changed. Aluminum sanding shoe is mounted on ball bearings for easy operation and control. Massive base and column construction provide solid foundation. The Mattison No .303 Automatic Stroke Sander is recommended as the most efficient method for finish sanding large, flat surfaces such as tops, panels, doors, etc. It provides perfect work on a real production basis. Double-belt model with coarse belt for removing tape and glue, and fine belt for finish sanding, speeds up production by reducing handling time and, in many cases, eliminates drum sander operation.

Send for complete information on the 303, the latest in stroke sanders.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS